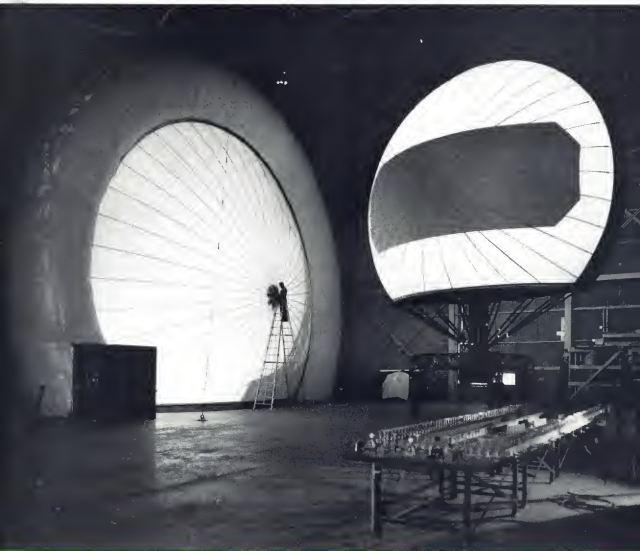


AVIATION WEEK

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PUBLICATION

October 22, 1956 50 cents

**Paraballoons: New
And Radical
Radar Antenna**
Paraballoons

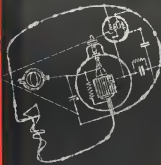


NACA's Mach 10 Test Rockets

PRODUCTION FOR YOU "Beyond the Wild Blue Yonder"

For your protection, Convair's deliv'ring F-102A Interceptor is now flying with the U.S.A.F. Air Defense Command. It reaches far into the stratosphere in a supercrack hour, pinpointing an invader in any kind of weather at any time of day or night! Then, gh' Engineering to the Nix goes in. Convair's F-102A has conquered tactical distance, extending freedom's protective barrier—far beyond the wild blue yonder!

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HOT SPOTS
IN YOUR ASSEMBLIES



BOURNS Model 160
TRIMPOT
—new high temperature,
high power design

The instrument operates stably in high ambient temperatures, or wherever closely matched components generally localized hot spots. The TRIMPOT will withstand temperatures up to 175° C. (347° F) with unimpeded efficiency. Load wires are Teflon insulated. High power dissipation—0.4 watt at 50° C. (122° F).

You'll find every outstanding feature of the original Model 150 TRIMPOT—standard at the industry—built into the Model 160. 25 turn adjust means are made with a speedometer on the shaft. The shaft is self-lubing, to provide stable settings. Resistance element is precision wound with low temperature coefficient resistance wire. Unit withstands severe shock, vibration and acceleration. To ensure its dependable performance under extreme environmental conditions, Bourns designed the Model 160 TRIMPOT to meet or exceed rigid government specifications.

Write for new descriptive literature



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AVIATION CALENDAR

Oct. 23-24—National Business Aircraft Show, Norfolk General Air Club and Farnham Air Center, Columbia Hall, Virginia. The Oct. 23-24—United Electrical Society Annual Equipment Display, San Pacific Air Division, Los Angeles, Calif.
Oct. 25-26—Second Annual National Meeting, American Institute of Aeronautics and Astronautics, Washington 25, D. C.
Oct. 26-28—Third Annual First Coast Conference on Aeronautical and Navigational Electronics, Fifth Regiment Armory, Baltimore, Md.
Oct. 31-Nov. 1-2-1956 Annual Meeting and Exhibit Society for Experimental Space Studies, Buckley-Wilton Hotel, Columbia 1, Ohio.
Nov. 1-2-1956 Twenty-Ninth National Trade and Market Study and Management Clinic, sponsored by Institute Management Society, Sherman Hotel, Chicago.
Nov. 12-13—North-South Annual Meeting, American Petroleum Institute, Hotel Concord Hilton, Kansas City and Sheraton Washington, Chicago, Ill.
Nov. 13-14—South Western Aircraft Displays, Convention, sponsored by Wichita Falls Park Station Hotel, Detroit.
Nov. 14-16—Symposium on Oxygen and Microwaves, sponsored by the Institute of Radio Engineers Professional Group on Vacuum and Propagation, Rensselaer Institute, Albany, New York.
Nov. 14-16—Laboratory Vacuum Conference, sponsored by Fluid Control Society, Houston, Texas.
Nov. 15—Conferences on problems and issues concerned with control and guidance of rocket approaches, sponsored by Institute of Transportation and Traffic Engineers, University of California, Berkeley, California.
Nov. 15-16—NATOPAC, New York National Training Conference, sponsored by N. Y. Chapter of the American National Training Society, Sheraton Parkview Hotel, New York, N. Y.
Nov. 16-17—Air Mail Program Eastern Division Executive, Ambassador Hotel, Washington, D. C.

AVIATION WEEK • OCTOBER 22, 1956
Vol. 65, No. 17

PHILLIPS 66 Aviation Gasoline is produced in its refineries at 150,000 barrels a day. It is refined to meet the requirements of the Federal Aviation Administration (FAA) for use in aircraft. Phillips 66 Aviation Gasoline is available in 100 and 130 octane grades. It is the only gasoline that meets the requirements of the FAA for use in aircraft. Phillips 66 Aviation Gasoline is available in 100 and 130 octane grades. It is the only gasoline that meets the requirements of the FAA for use in aircraft. Phillips 66 Aviation Gasoline is available in 100 and 130 octane grades. It is the only gasoline that meets the requirements of the FAA for use in aircraft.

One in a series about users of Phillips Aviation Products

Phillips 66
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with
UNITED

"We made a \$3,500,000 investment in the future of air freight." That's the statement of E. L. Mangold, manager of cargo sales, United Air Lines. Mr. Mangold referred to United's recent addition of two new DC-6As to its cargo fleet. This addition to its DC-4 Constellation will expand United's all-cargo productivity from 125,000 to 225,000 ton miles daily. The 5-cabin-capacity DC-6A cargo carriers will fly coast-to-coast in less than a half a day, including an en route stop; they will cut 6 hours westbound and 3½ hours eastbound from Minneapolis to Rights.



ACCENT ON SPEED—cruising speed of 305 miles an hour and quick loading through innovative main cabin door ensure swift delivery of mail, freight, express.



HUGE MAIN CABIN—for 4,433 cubic feet of space, more than 300 to-draw cargo and is powered. Temperature control permits range of 40 to 70 degrees.



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READY FOR ACTION



DOUGLAS B-66, ALL-WEATHER TACTICAL BOMBER TAKES OFF FOR PRACTICE MISSION

B-66, Protected by General Electric Automatic, Electronic Tail Armament Gives TAC Greater Mobility, Flexibility

Built for high speed interception and reconnaissance, the Douglas B-66 is the latest addition to the Tactical Air Command's offensive power. General Electric's MD-1, electronic tail armament system provides an accurate, defensive punch to help the all weather bomber accomplish its mission.

To assure optimum integration of components and continuously high performance of the equipment in the field, the system is completely assembled and tested at the factory and followed through operational usage by highly skilled General Electric technicians. General Electric's complete, follow-through service helps keep the B-66 tail defense system truly "ready for action"—ready to counter with speed, precision, and reliability.



GENERAL ELECTRIC ARMAMENT SYSTEM gives B-66 greater automatic warning of no intruder, split-second analysis and positioning of guns with correct lead for a kill.

OVER-ALL CAPABILITY OF G.E.'S
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ASSURES READY-FOR-ACTION SYSTEMS



COMPLETE TAIL TURRET PACKAGE, made up of G-E radar scanner and gun barrels, is assembled for shipment to Douglas for incorporation into B-66 airframe.



FIRE TESTING of assembled tail turret in indoor range assures delivery of "combat ready" defense system for the aircraft's last flight.



SERVICE ENGINEERS help Air Force attain maximum armament maintenance standards, provide G-E designers with field data to speed improvements.

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2

During straight and level flight, the power can meet precisely maximum fuel efficiency to assure the maximum range.

3

During combat, the complex curves of the three dimensional cam become the pilot's most sensitive assistant by automatically compensating for changes in pressure and temperature.

Automatic fuel power is required for split-second climb and vertical dash to extreme altitudes. The Holley three dimensional cam must additionally compensate for instantaneous changes in attitude and temperature.

How the Holley three dimensional cam functions as an automatic co-pilot

The job of the Holley Power Control for jet aircraft is to sensitively control engine power according to the pilot's requirements and, at the same time, make automatic adjustments for split-second variations in altitude, pressure and temperature. The "brain center" of advanced Holley controls is a three dimensional cam which is so constructed that it can adapt itself to all combinations of atmospheric temperature and pressure, from Thule to the

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In addition to the automatic compensations made for the pilot by the three dimensional cam, it interprets the pilot's request for changes in power. It's the most important link between cockpit and engine.

The three dimensional cam, like the power control itself, is designed, engineered and manufactured by Holley—one of the world's foremost power control manufacturers.



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28

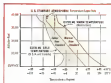
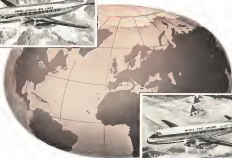


FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau

TURBO-PROP OPERATION

Fuel Requirements in Warm and Cold Climes



Graph shows temperature increases for warm and cold conditions ground soil at operating altitudes.

In turbo-prop operation, payload and fuel performance are closely tied together. When selecting the fuel's characteristics, ground temperatures in some operations play an important part.

COLD CLIMES—Trans Canada's Vancouver planes are based in areas where winter ground temperatures drop as low as -40°F. Under these conditions, they use Mobiljet 4. With a freeze point of -36°F it is free flowing at lower temperatures... easy to pump and won't clog lines.

WARM CLIMES—In winter climes where the ground temperature problems is not so severe, Middle East Airlines get top performance from its Vancouver with Mobiljet 1.

Each of these high grade fuels possesses the outstanding quality and sufficiency that help you get the most economical operation... meet minimum payload and scheduled departures at all times.

For Top Flight Performance—Make it



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Now make room for more payload and other equipment. Fly with ARC-reliability, less weight, less spin, less drag. Ask your dealer for complete details.

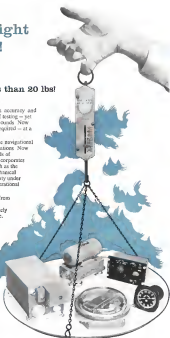
TYPE 21 ADF WEIGHS ONLY 19.7 POUNDS!

Component Weights (Approximate):
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 Control Unit, 1.6 lbs.; Antennas, 1.1 lbs.;
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 Remotely-actuated.
 Special model 56-P
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 F. operation.

Write for data sheet SM-10



TYPE 5 SWITCHES Series 51

S.P.D.S., 2 circuit, 10 amps, 125/250 v. AC, 50° to 325° F. max. temp. no voltage limitation on switch or on size of switch. Also available with reset button at bottom of switch or in Type 5-100 Multi-Reference Series where switch completes or opens circuit before interrupting a/c line.

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Write for data sheet SM-10

DOUBLE-POLE SIMULTANEOUS ACTION TYPE 5-8

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HERMETICALLY-SEALED DOUBLE-POLE SWITCH Type 5-9

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TYPE 5-9, 4 Circuit 15 amps, 125/250 v. AC/50° to 325° F. max. temp.

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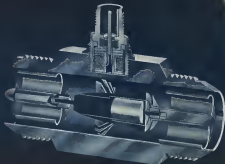
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New Departure split inner ring bearing
mounting for jet engine main shaft



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INSTALLATION

Today's leading production jet engines lean on New Departure split inner ring bearings... an out-of-the-development of New Departure's continuing Aircraft Research Program.

These turbine bearings handle heavy thrust loads from either direction and major radial loads with unequalled dependability. Two-piece inner ring construction facilitates cleaning, inspection and assembly. It also permits use of the maximum number of balls of largest possible diameter with high thrust checks and complete separator construction.

While these bearings meet today's demand, tomorrow's needs command the facilities of the New Departure Aircraft Research Program. Already bearing development looks aimed to operational speeds in the order of 100,000 rpm and temperatures close to 1000° F. Write for New Departure's Aircraft Turbine Ball Bearing Folder TB-56 New Departure, Division of General Motors, Bristol, Connecticut.

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Bearing Size	NOMINAL DIMENSIONS			
	Bore	OD	W	W ₁
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236	7.0864	10.2562	1.214	
244	8.4104	12.3164	1.521	
320	4.9307	7.0061	0.280	
324	4.7248	7.4401	0.260	
326	5.1181	7.5740	0.280	
328	5.5118	8.0118	0.270	
330	5.9055	8.5540	0.270	
332	6.2992	9.0000	0.260	
334	6.6929	9.4459	0.270	
307	5.5780	8.8046	0.40	
309	5.7717	9.3445	0.36	
312	5.2403	8.9007	0.44	
313	5.5501	8.7246	0.52	
314	5.7529	9.1161	0.50	
315	5.9558	9.5111	0.54	
316	6.1586	9.9118	0.53	
319	6.7462	10.6229	0.55	
320	6.9513	10.8846	0.58	
323	6.2887	9.7446	0.57	
324	6.7346	9.9846	0.58	
326	6.9518	10.4846	0.56	
330	6.2812	10.1950	0.60	
307	5.5780	8.8046	0.40	
315	5.9558	9.9118	0.54	

*Hole grooves, outer ring or both rings

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VOL. 46 NO. 17

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► Air industry faces chronic dilemma of trying to produce aircraft with broad, combined commercial and military markets

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► U. S. and foreign airlines offer 20% more transatlantic seats this winter season than last

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► Multi-stage Mach 10 rockets of NACA help gain design data for intercontinental ballistic missiles

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► Radically different type of radar antenna afforded like a balloon described as "major breakthrough for air defense"

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COVER: Technological breakthrough in the design of bullet radar interceptors has been noted by new "Thunderbolt" type which can be inflated or deflated like a balloon. Developed by Westinghouse Electric Corp., new Thunderbolt interceptors greatly increase mobility and effectiveness of tactical air defense radars. Cover shows 30 ft diameter balloon being inflated at defense command ship's radar intercept. For additional details, see page 34.

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AVIATION WEEK • OCTOBER 21, 1956 • Vol. 46, No. 17

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AVIATION WEEK, October 22, 1956

25

B.F. Goodrich Avtrim



Passengers walk on diamonds in Braniff's new DC-7Cs

THE nearest passengers step aboard Braniff's new fleet of Douglas DC-7Cs, they'll be greeted by the pleasant pattern of B. F. Goodrich Avtrim. They'll also find Avtrim in the galley and lounge where Braniff goes all out to give a feeling of luxury.

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EDITORIAL

Are Air Shows Necessary?

All of the major superpower nations in the world today find it desirable and necessary to stage air shows to demonstrate the quality of their aerial products both military and commercial. American West has provided on-the-spot coverage regularly on the U. S. National Airshow Show, the British S.B.A.C. flying display at Farnborough, and the International Paris air show in Paris. Last summer we added the Russian national aviation display at Tushino and some outside Moscow to our long list of on-the-spot coverage. Based on the experience of our staff correspondents at these various air shows we have a few random thoughts on their usefulness and proper place as an instrument of national air policy.

These major air shows are carefully tailored to meet specific national needs and thus vary greatly in content and purpose. Of the four, the U. S. show seems to be most lacking in clarity of purpose although during the past few years it has been amazing about and more the character of a spectacular aerial report on military aviation to the U. S. taxpayers who provide the money to pay the national superpower bill.

Commercial Emphasis

This is a worthy goal but there is a growing sentiment in the aircraft industry that there should be more emphasis on the commercial aspects of aviation if the show is to retain its flavor as a truly national air show. It would appear that there is a much larger place for business and agricultural flying and air transport in the National Air Show picture than was evident at either Oshkosh or this year at Philadelphia last year. There is little doubt that the policy of moving the show around the country rather than having it at a permanent annual stand is sound and should be continued.

It is equally evident that some serious thought should be given to eliminating or reducing the commercial factor in the show by improving the facilities provided there for viewing the aerial display. It seems odd to charge the taxpayers for the privilege of viewing military aviation that they have already paid for with their tax dollars. If an aviation law is introduced, some substantial effort should be made to provide a better view of the show from temporary bleachers so that John Citizen gets some service for his money.

Russian Show Goals

The Russian air show at Tushino is perhaps the biggest driving nail of the quarter with close to 400,000 attending on a single day and staying long after the flying is finished to picnic on the grass airfield and listen to the full range of a dance bands and choral groups. It is designed to convince both Western and Russian citizens of the growing might of the Red Air Force. It is aimed at providing domestic assurance of air protection for Soviet and satellite peoples and warning to potential

invasion enemies that they will have no easy task penetrating to Soviet targets.

Our judgment is that the Tushino display is second year has been fairly successful in achieving these goals. It is also interesting to note that the Soviets have consistently used the Tushino show in the stage for revealing their new military and commercial aircraft even to the degree of flying advanced experimental prototypes.

The Society of British Aircraft Constructors annual flying display has become a success for technical, military, agricultural and civilian people of international aviation. The business-as-usual aspect of Farnborough has grown enormously in the past years even as evidenced by the location from a few tables serving as hospitality centers to the long rows of blue and white seats that now house an astonishing variety of food and drink.

Another strong trend in the S.B.A.C. show has been the growth of the static exhibits of the equipment industry. They now overflow onto the main road specifically designed to accommodate the aircraft industry's exhibition growth. It is the increasing participation by the equipment industry that keeps Farnborough an annual show. The aircraft and engine people who originally dominated the display would much prefer a biennial show allowing them time to put forth more new products. However, Farnborough will continue to be an annual show largely because the equipment makers who now make it such a profitable venture want on this frequency.

British Export Aim

The British show is aimed entirely at the export market and provides a broad and spectacular backdrop for the entire British aviation international sales effort for military and commercial equipment. It has certainly contributed to the steadily rising sale of post-war British aviation products abroad although the amount of time it spends from the technical part of the industry has never been adequately assessed.

Beginning with the 1955 Paris air show the French event took on new vitality and significance. It is now one of the "must" parts of call for those who must keep abreast with international aviation. By showing it every two years, the French can produce sufficient novelty and variety to pay off all of the cost of a new floor show at the Salon. The 1955 Paris show and the 1957 edition scheduled for next May should clearly establish the fact that this nation is again in the forefront of aeronautical development and a force to be reckoned with in military aviation and in the fierce commercial competition that is now characteristic of the international aviation market.

We think national air shows are clearly necessary to the health and growth of aviation, and commercial aviation. However, there must be carefully selected to accomplish specific purposes and not carelessly thrown together to provide an aerial Russian holiday.

—Robert Hoots



Bob Van, Sam Anderson, John Hubert, James H. ...



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AERO REGION

Commander

AERO REGION AND ENGINEERING COMPANY

... ..

Washington Roundup

No Satellite for Army

The Army will not launch a satellite "accident" in otherwise.

Despite published reports from several quarters, top Army research and development officials are unenthusiastically rejecting proposals, money, and time of Army Ballistic Missile Agency (general) and others at Redstone Arsenal are committed to other projects, arms and for the future.

Gen. Del. Wetherby was Brown, one of the first and most vocal advocates of satellites and one of Redstone's most influential scientists, scoffs at the idea.

Von Braun points out that "satellite" satellites, launches are impossible, and that a "quick" launching would be needed to be for satellites with Navy, Defense Department, Congress and the public.

After President Eisenhower committed the U. S. to a satellite program—and in effect, in a race with Russia for the first launching—Defense stated all other services to prepare programs.

The Army's own latest upon existing hardware, stressed a quick launching to gain prestige over Russians called for more satellites possible even without materials.

The Navy's program was more ambitious, calling for new hardware and a sophisticated satellite. Air Force plans were based upon the Atlas missile, which will be in the test fleet.

Dr. von Braun insists that when Navy got the nod, the Army dropped its satellite idea and has not, and will not, suggest—formally or informally—that it is allowed to its to last Navy into the do.

Only possible way that the Army might enter the satellite picture was Brown said, is for the Vanguard project to fail a second year. Then Defense officials might allow the Army to try to launch up some kind of launchers before the International Geophysical Year ends in December 1955, whether it had instrumentation or not.

May Gen. A. P. G. Moore, Deputy Chief of Army Research and Development, points out that attempted launching now would take dollars and hardware Army funds existing programs. They will not happen, he said. Office of William H. Martin, Director of Research and Development, said the same.

Dr. von Braun, in fact, hopes the Vanguard program is successful not only because Redstone has its hands full with other work but because it would require "a greater breakthrough than our proposal would have."

Budget Wise Mr. Wilson

Citing the long lead time involved in most aircraft procurement, Defense Secretary Charles E. Wilson said USAF will not spend much of the additional \$500 mil. has provided by Congress during the current fiscal year instead be utilized, the money will be used to help ease the budget burden for fiscal 1955. The extra money, Wilson said, is bound to have some effect on the new requested funds for 1955.

Where Time Is Lost

Action on the Aircraft Study Group's program to cut the weapon system cycle (AW Sept. 17, p. 16) will be delayed until after Jan. 1, when the military services are scheduled to come up with their programs. Meanwhile, Deputy Secretary of Defense Roscoe B. Robison, Jr., has called upon the Aircraft Industries Assn. to consider the recommendations and distribute what it can to the general public.

Robison is of the opinion, after studying the report, that from a third to a half of the time involved in getting a weapon over the road from concept to delivery is lost even before the formal requirements documents are written. The document at this stage, he admits, are delayed by poor communications, a lack of ready up-to-date data on technical feasibility, military significance, probable cost and other factors. He accepts the Study Group's thesis that the military services must organize themselves for development and production programs.

Some AIA members, long unhappy with military requirements studies, will applaud the document and hope for improvement. According to Robison, major steps will include more full-time effort by qualified military officers; faster distribution of timely information and early report by the industry in the performance of long lead time contracts and components.

It also is clear that industry will get more technical data and get it quicker, that detailed specifications will be cut back, engineering change approval will be speeded and healthy requests expedited to ease the burden on industry.

Celler Hearings Through?

The House Air Materiel Subcommittee headed by Rep. Emanuel Celler (D-N. Y.) has abandoned plans for pre-hearings on an Air Force budget. It is even doubtful that the hearings will be held this year, and a report of findings and recommendations traced. The purpose of strategy hearings this spring, Celler said, were to determine whether proposals were involved in the cases of Air-Armament World Assistance, the Air Transport Assn., Air Corps Transport Assn. or the International Air Transport Assn. If the subcommittee's investigation is to continue next year, the full Judiciary Committee would have to vote a new authorization for it.

Army Intrinched in MAAG

A major USAF reason behind its Assistant Secretary Dudley C. Sharp and Maj. Gen. David H. Baker, Air Materiel Command Director of Procurement and Production, is that the Air Force is not getting the same high quality observations about the Mutual Security Program. One striking fact out of 34 Military Assistance Advisory Groups (MAAGs) 21 are headed by Army officers, eight by the USAF. The United Kingdom and Spain are only two countries in the U.S. figures are high. Army MAAGs clearly include 13 major general, two brigadier general. USAF staffs are limited to two major general, one brigadier general.

New Prominence for Harris

The death of Rep. Percy Priest (D-Tenn.) makes Rep. Otto Harris (D-Ill.) top ranking Democrat on the House Interstate and Foreign Commerce Committee which handles civil aviation matters. In the past Congress, Harris served as chairman of the Subcommittee on Transportation and Communications. His primary interest as chairman has been the development of the aviation system. He is now equal control of all commercial air transportation.

—Washington Staff

Conflicting Policies Hamper Design Effort

USAF policy discouraging the design of military planes to CAA specifications cuts civil market.

Washington-Arm's struggle with the Air Force over aircraft procurement (AW Oct 5, p. 24) points up a chronic dilemma faced by manufacturers when they try to produce aircraft with broad, combined commercial and military markets.

The Army is currently developing a campaign to reduce the Air Force role as a competitor to Army aircraft procurement. A key theme in the Army campaign is the insistence that its aircraft be designed to meet Civil Aeronautics Administration certification requirements as well as military specifications.

Air Force opposition to this dual acceptability illustrates the industry's pain when it is designing a military aircraft that has a major commercial application. Manufacturers would like to design their aircraft so they can pass both civil and military test, but, without complete Air Force acceptance of this design philosophy, the industry generally is told up design to military specifications and getting up on the civil airplane.

Money is a key in the situation. If the Air Force does not spend that a new aircraft be designed to meet CAA requirements, the manufacturer has to pay for extra CAA design work himself.

Along with this, the manufacturer must watch to insure that the aircraft is not too much civil rules when it might jeopardize his chances of getting a more lucrative military contract.

Industry's Stand

This conflict in philosophy has a history of negotiation between the CAA and the Air Force and was studied by the Air Coordinating Committee these years ago when it was studying the post-war policy on military for the Eisenhower Administration.

The Civil Air Force adopted by the President in 1955 announced that all transport aircraft (fixed-wing and rotary-wing) except those designed for specific military missions, should be designed to meet the basic civil aircraft standards.

The policy report pointed out that it has proved extremely costly to cost out war-time transport aircraft to avoid use, and that such costs can be avoided by using a single design standard for all transport aircraft.

Manufacturers feel that the Air Force has paid only lip service to this policy when it has bothered to pay attention to it at all. They feel that

designing a transport with both military and civil applications will broaden its market and result in lower prices for both customers.

Emphasizing CAA requirements with military applications as top of their world prevents development of aircraft in civil fields the manufacturers cannot afford to enter solely on a commercial basis.

Helicopters and cargo aircraft are two categories where the industry can't afford heavy development programs because of limited markets that, with substantial military contracts, support development of aircraft with common certification, and, the industry could provide commercial operators with the most efficient aircraft they need for most missions.

No Policy Without USAF

Generally, the aircraft manufacturers support the administration policy, as policy makers, and they feel it should either be fully implemented or disregarded, not retained in such a paper regulation.

Industry reports point out that the Air Force has been inconsistent in the policy cannot be implemented. While the Air Force does not object to a manufacturer including features based on the CAA rules in his design for a new airplane, these features are optional. Most manufacturers would not jeopardize their chances of winning a military contract by outgunning their design with CAA features.

An example of this problem is the emergency developing on the design of tri-engine and four-engine turboprop aircraft, supported by the Air Force. The USAF has been looking on a light, three-engine, four-passenger military trainer and a medium-weight military trainer, eight passenger utility transport.

New Air Force Policy

Three new plans are being designed under a new Air Force policy that requires a pre-attack decision of development program in which the manufacturer must have a prototype ready for testing before the Air Force

will decide on the production contract (AW Aug. 27, p. 29).

These new aircraft will have commercial applications and, therefore, a commercial market.

In its intention to bid, the USAF said it is willing to consider design requirements which may be necessary to quickly design for CAA certification.

Since the Air Force did not definitely specify that the design be capable of CAA certification, designers anticipated the competition and now make up their minds whether to design for both civil and military specifications and possibly compromise their chances of winning a military contract.

The Army is a strong supporter of the ACC policy recommendations. As its mission programs has grown, the Army has become more and more insistent that the regulations that all aircraft must be produced through the Air Force.

Now, the Army is insisting that all of its aircraft with a major commercial application be capable of CAA certification. The Army says it needs to buy aircraft the "quickest and cheapest way" and will buy from the Air Force with direct purchases if USAF attempts to incorporate the CAA standards in contracts.

This stand could be a big help to helicopter operators. With military backing for design of helicopter in CAA standards, the operator would not have to get aircraft that can't pay for developing all by themselves. In turn, the Army wants to get as many helicopters into commercial use as possible to help improve the utilization and maintenance of rotary-wing aircraft.

Why USAF Opposes Policy

The Air Force is still in the civil design philosophy and civil officials have continued to decline ordering them to implement the ACC policy. A CAA engineer reports in a private letter a CAA standards while an aircraft is under several months up, and the recommendations approach "you are not serious."

USAF spokesmen discount not in a fact in their belief to design use of CAA standards. They say Air Force objections are based on technical considerations. For instance, military aircraft have to operate in extreme of heat, humidity and cold stress conditions which are higher than required by CAA, which has requirements based on maximum performance, rather than optimum performance.

One USAF procurement official



BOEING 767 prototype shown here in one of its most important roles: a commercial airport. Seattle/Tacoma is prime example of aircraft with just commercial design approach. Boeing said the design, which is developed with its own funds, to USAF at KC 135 jet tanker. Boeing has orders for 154 767s as commercial transports.

What we have an requirement for CAA certification and no intention of setting up such a requirement, but we certainly encourage the manufacturer to provide it on his own if he wants to and meet some commercial objectives.

Another factor is that USAF's military purchases have to follow the established standards of HHS (Department of Defense) and the handbook would have to be rewritten if procurement officers want to follow a new policy.

Closer USAF, CAA Liaison

Contributing to the Air Force disparity in the last that the CAA demands to a great extent upon the integrity of the manufacturer, while the Air Force conducts its own testing for military aircraft. Also, aircraft can be built to CAA standards and be produced from a limited number of suppliers, and the USAF wants to retain a degree of control over the supply base for quality control and maintenance purposes.

Some Air Force officials feel that continued cooperation with the CAA is leading to greater understanding between the two, and that the two sets of standards are becoming more identical.

USAF's recent decision to let manufacturers to develop new aircraft in their own military-commercial sales is a step away from dual practice. If it proves successful, Air Materiel Command may use the pro-

cess to save money on development and promote design of military aircraft to CAA specifications at the same time. Right now, the main purpose is to use development money.

CAA Position

CAA says it has no role to play in the controversy. The agency feels it has a stand set of rules on which an airplane can be based and is willing to work with anyone who has an airplane to construct.

The CAA does work with the airlines across on some aircraft when it is. Its participation in the military development cycle, however, is purely advisory and does not mean a certificate is issued when the military accepts the airplane. Such participation is designed to help find ways of meeting the Civil Air Regulations.

Commercial operators and the CAA have both had their troubles with getting military aircraft designs into civil operation.

"The C46 is a good example of a transport designed basically to military specifications," the CAA has had difficulties troubles with the transport since the end of World War II, and it still has under special regulations.

Another example was the C-124B. When the Air Force ordered a number of these military-designed cargo carriers, airlines, and operators showed such interest. Interest cooled somewhat when it was discovered that conversion necessary to make the C-124 meet CAA standards were as steep,

the expense would be to replace the commercial operator.

The surplus situation tempers the enthusiasm of some manufacturers for making military aircraft capable of certification. If the Air Force should develop a large number of such surplus surplus and dump them on the market at lower future dates, the appearance of such cheap aircraft could ruin the market for more future commercial design.

USAF's Air Materiel Command, which develops surplus aircraft from time to time, says it is a desired policy not to dump the market. Aircraft are offered for sale only in limited quantities and will be held back if there is any danger of upsetting commercial sales values.

Dual Role for 707

The Boeing 707 has developed as an aircraft which shows the benefits of the post-war commercial military design approach. Boeing has sold the design, which it developed with its own funds, to the Air Force and has contracts for the KC 135 jet tanker.

The single aircraft is the basis of the 707 series of commercial transports, and Boeing has airline orders for 154 of them. The 707 is currently going through the CAA certification process.

Lockheed's Lockheed C-119 freighter could conceivably be the answer to the airlines' need for a true cargo transport. But Lockheed has not yet decided whether it will go to the expense of putting the C-119 through the CAA certification process.



New Tow Target Craft

USAF's new jet-powered tow target with Martin B-70 can be towed by two F-16s. The new Tow Target System of Vietnam Air Force Base, Yuma, Ariz. The Tow Target System is designed to tow targets, B-70s, and other aircraft to a target location to be engaged by the F-16. The system is designed to tow targets to a target location to be engaged by the F-16. The system is designed to tow targets to a target location to be engaged by the F-16.

Pilot Skill, Engine Performance Give X-2 Record on Final Run

Washington—Capt. William G. Apt's skillful handling of the Bell X-2 to reach peak and the exceptional performance of its model engine accounted for the record speed reached on its final flight on Sept. 27, the Air Force said last week.

The speed has been reported at above 2,000 mph, although the Air Force has not confirmed the figure.

Capt. Apt was killed and the X-2 destroyed at Edwards AFB shortly after he reported a successful power run on his first flight (AW Oct. 1, p. 34). The Air Force and first in planning an optimum flight pattern for Capt. Apt's flight, emphasis was placed upon obtaining optimum attitude, control acceleration, and maximum use of controls rather than speed.

After the drop from the B-50 mother ship, however, Capt. Apt handled the X-2 as if it were a conventional aircraft, the Air Force said.

Thus, plus better operation of the Canam Wright XLR-2 engine than on any previous flight, resulted in the record speed.

The Air Force said after pilots had approached optimum operation with the X-2 only after several hundred hours of flight.

Lt. Col. Frank K. (Pete) Everett flew the X-2 five times before reaching 1,500

mph, and Capt. Tom Kinkadee, Jr. flew it three times before he took it to a speed 125,000 ft.

When being towed and controlled problems Capt. Apt found at his record speed have not been revealed, although it is believed enough data has been received from the X-2's instruments to provide the Air Force with some of the answers.

The Air Force broke its attitude barrier after three weeks of seeking to answer questions on the loss of the X-2. Although the final report of a board of inquiry had not reached the Pentagon by the time details of the last flight were revealed last week, preliminary reports have been in the hands of top Air Force officials for some time.

Air Force Secretary Donald A. Quarles said in a speech two weeks ago that Capt. Apt had flown better than any other pilot in the history of the Air Force.

Capt. Apt, 32, was a product of the Air Force Flight Test School at Edwards AFB. He had made powered runs with the X-2 on the ground, used as a model engine and as a model engine.

He also had flown the close range on X-2 flights, including the recent flight on which Capt. Kinkadee reached his record altitude.

New Commence

Lock Haven, Pa.—A new model of the first plane to fly in the world, powered by a 250-hp. four-cylinder engine, will be added to the fleet of the Air Force. The new plane is the first of a series of planes to be added to the fleet of the Air Force. The new plane is the first of a series of planes to be added to the fleet of the Air Force.

Douglas Says Airlift Needs Will Increase

Salt Lake City—USAF is capable of meeting all DDC airlift requirements only by doubling the utilization of military transport and cargo for the Civil Reserve Air Fleet of 350 four-engine aircraft, Air Force Undersecretary James H. Douglas told the National Defense Transportation Act here.

Douglas said that, if the Army requests a 10% increase in airlift, the Air Force will be forced to use its own and military transport carriers, the Military Air Transport Service and CMAF.

There is an already established requirement for substantially more, which then is available," he said, "but it seems to me that pressure for increasing strategic or long-range airlift for ground forces can be met in increments."

Army Secretary Wilbur M. Bricker

secretly said that he had been amazed that airlift is available to meet at least the newly requested 10th Airborne Division (AW Oct. 5, p. 77). It was clear at the time that Douglas's optimism was not shared by a number of his top military aides.

Douglas also noted the low priority given airlift within the Air Force. He said, "The competition for dollars between bombers and fighters and transports usually operates in a progressive government of military transport, but the Air Force is slowly acquiring thoroughly modern transport transports."

Douglas said present MATS has eight transport aircraft in flight, more than four hours a day this figure fell as low as two hours shortly after World War II. He said MATS plans to increase its airlift rate.

Burke: Talos Scores Six Hits at 37 Mi.

New York—Talos anti-aircraft missile has scored six direct hits in one occasion on airborne targets at a range of 37 mi. during recent tests. Admiral Arthur W. Burke, Chief of Naval Operations, told the House of Representatives last week. Among other new Navy developments revealed by Burke were:

- Development of a supersonic missile with a stern ramjet capable of bringing the Navy's P-38 SeaMaster into play for major attack.
- Development of submarine-launched cruise missiles for special operations of the SeaMaster.
- Development of a new type of missile for the Navy's fleet, which will be able to operate in a 5 ft. space and wind conditions to high as 90 knots.

Doolittle Heads NACA

Washington—Lt. Gen. James H. Doolittle (AW Oct. 1) has been named chairman of the board of the National Aeronautics and Space Administration, the new agency created by the National Aeronautics and Space Act.

The Doolittle committee was created to coordinate engineering at the National Aeronautics and Space Administration and head of the MIT Aeronautics Engineering Department from 1935 to 1945, he served as NACA chairman from 1945. He was named to serve as a member of the board.

Gen. Doolittle, a vice president of Shell Oil Co., is a special member of the National Aeronautics and Space Administration and a member of the Air Force Scientific Advisory Board.

- Development of an atomic-powered airplane for the Navy is currently hampered by lack of sufficient funds.
- Navy anti-aircraft missile has passed stage up to 300 mi. but experimental developments are being pushed to extend the Navy's early warning range considerably further.

Military Air Accident, Fatality Rates Decline

Washington—U. S. military aircraft accident and fatality rates have declined from more than 40 to approximately 25 per 100,000 flying hours since 1953, according to statistics compiled by the Defense Department.

Without disclosing actual figures beyond a total of 7,600 killed in military aircraft since 1951, the Department said that there were:

- USAF rates tend to be lower than those of the other service because total flying hours include long flights in such major planes.
- Navy's higher rates reflect the hazards

- of aircraft-hungry in single-engine aircraft with a single pilot.
- High Army rates result from frequency of accidents in rotary-wing aircraft. For the Navy and Marine Corps, helicopter accident rates are equally high.
- Although the probability of a major accident has declined, those which do occur are increasing in severity. Thus in 1950 only one accident out of 15 was fatal. In 1951, 2.6 out of 13 were fatal.

- Flying accidents in 1953 cost more than \$600 million in damaged or destroyed aircraft, up 20% from 1951. This is because planes are becoming more expensive.
- Jet fighters and bombers have a higher major accident rate than any other type aircraft, although their rates have declined for the past five years.
- Fundamental cause of accidents is pilot error, accounting for 50.2% of all aircraft accidents. Material failure is blamed for 23.4% of the accidents.
- About half the accidents occur during landing.

Baker Calls for Radical Changes To Meet Tough Production Flight

Phoenix—USAF and the aircraft industry face "a long, tough production fight" with no end in sight, and that there are no radical changes to meet the demand, according to Maj. Gen. Donald H. Baker, Air Materiel Command Director of Production.

Improved airplanes and missiles, Gen. Baker said, must be produced in large quantities and at a low cost, as well as at a rate which will be consistent with the state of the art.

Gen. Baker, in a speech before the National Industrial Conference Committee, predicted these changes that will have a profound effect on USAF and the aircraft industry.

- Radical, major and radical changes will require new test and development facilities. Knowledgeable concepts for the country cannot bear the cost of the new, larger facilities.
- General tests will require new and more extensive test facilities.
- Heat and strength problems will require new types of materials both in structures and power plants.
- New production techniques must be developed to force these materials into production, change and form to be used in the present capacity.
- Production methods and equipment must evolve more automation to meet these demands with maximum waste and maximum accuracy.

- Large quantities of skilled workers and technicians will be needed in the aircraft industry working force.
- Shortage of professional scientists and engineers will become more serious.

Gen. Baker also predicted that several other types of material, heavy engineering, materials will be needed in the life span of the Boeing B-52D Superfortress, and other aircraft. He said that the aircraft will be needed, as well as at a rate which will be consistent with the state of the art.

For maintenance, the General said, more and more will be needed with single, speed and altitude will be beyond current models. Ultimately, these will be replaced by more advanced missiles.

First Space Lab

Nature's first space (space) simulation laboratory, capable of simulating the conditions encountered in space, is being built by the Air Force. The lab is being built by the Air Force. The lab is being built by the Air Force. The lab is being built by the Air Force.

Bristol Official Urges Complete Reappraisal of British Air Industry

London—Complete reappraisal of existing projects is "the only way to avoid permanent injury" to the British aircraft industry, according to P. R. Banks, a director of the Bristol Aeroplane Co. Ltd.

The Royal Air Force already rejects fourth behind America, Russia and Sweden in the quality of its equipment, Banks told the Royal Aeronautical Society last week. He blamed that state partly on the "irrevocable time taken to issue an Air Ministry requirement" and partly to the "costs, which were so close cut, enough to the implications of the new [jet] air." (See story p. 15.)

Look to U.S.

A good place to start the reappraisal, Banks said, is with a look at the American industry with an eye towards adoption and modification of its techniques for British use.

At the same time, moving on the basis of glowing press reports from Emborough that all was well with Britain in the air, added weight to earlier thoughtful remarks of the British aeronautical press.

We should take the realistic view that it would be unwise to attempt to compete with America in the scope, variety and use of their various projects," Banks said. Instead, he recommended concentration on smaller as modernized civil transportation to 150,000 lb. gross weight and increasing the needs of the specialist operator for military development, he suggested the impetuous bomber and the KCBM, even if only one design of each could be developed. All not compatible with Russia and the United States in engine quality and performance also was noted.

Consentation Prices

As part of the industry's reappraisal, Banks suggested the weapon system approach for both the design teams in industry and the requirements team in the Air Ministry. To assess the proposed designs, Banks recommended the creation of a weapons evaluation team in the Ministry of Supply, the contracting agency for all British aircraft and aircraft engine research and development.

In opposition to some British views, Banks did not advocate elimination of MOC.

Selective awards of contracts, based on weapons evaluation, was suggested by Banks, he added that "consolidation projects, in the form of prototype and

Francis Rodwell Banks

Mr. Banks is a long engineering career associated with prominent development in private industry: the Royal Air Force and the Ministry of Supply. During World War II, he was Director-General of Engine Production and later Director of Armaments Research and Development, succeeded from the RAF Volunteer Reserve to the Ministry of Aircraft Production. After returning to the Associated Engine Co. in 1946, he was loaned by the firm to the Ministry of Supply in 1952 to be Principal Director of Engine Research and Development. He was named to a directorship of the Bristol Aeroplane Co., Ltd., in Oct. 1954.

harder protection cells" should be avoided.

Assessment of new weapons should be based also on the capability of a firm to design, develop and produce aircraft at a desired rate, Banks said.

Requirements handling in the Air Ministry has been handicapped by two factors: lack of a high degree of technical knowledge on the part of some of the officers appointed to the job, and the lack of cooperation in ef-

fect. Banks said these should be a corps of engineering officers of the highest technical qualifications and with their personnel there could perhaps be formed the British equivalent of USAF's Air Materiel Command.

Viewing the transport side, Banks said that the British must organize larger technical and production units to get up the scale of meeting commitments from the United States and Russia. A machine design for profitable manufacture would be about five large aircraft per month, he said, this calls for nearly larger production units if it is to be considered at all.

Engine Assets

In the engine industry, we have the greatest asset and contribution to our strength and progress in aviation," Banks said, "and all that could waste about overnight and the situation as a whole be made bankrupt by any false move, made in the name of national economy, to reduce the scale of effort which is already being postulated by a downgrading aircraft situation."

Banks pointed out that Britain will have to diversify into advanced and logical program of research and development in line with leading countries.

"The lesson we should have learned is that aviation has given us big business and serious business, and that it cannot be run by a few people with ideas. It needs considerable thought, firm-line organization and economic facilities to get anywhere in it."

CAA Cautions Use of Glass Fiber

Washington—Civil Aeronautics Administration today issued a note of caution in the use of glass fiber cloth for recovering small aircraft.

CAA's safety report stated that glass cloth is not the "monoclonal material" aircraft owners had hoped for and said adequate application of the cloth can be a "short cut to a failed airplane."

They argued, however, that glass fiber is more flexible and it is not so strong as doped cotton fabric.

Difficulties in getting a tight covering and in securely fastening the material to the aircraft frame are the chief problems concerning glass cloth structures, the CAA said.

No material is now known, they added, that will attach the glass cloth tightly into place as doped cotton fabric.

The CAA said air pressure will cause ballooning of the cloth if it is loose, delivering itself and creating air.

While glass cloth unprotected with more does not lose easily, its special rigidity again warned.

In addition to this, resistance to chaf-

ing is not a characteristic of glass cloth.

For some time, aviation owners have been seeking a substitute covering for cotton, because the fabric normally deteriorates rapidly, causing an expensive recurring job every few years.

Glass cloth once appeared to be the answer, and the CAA will approve a glass cloth replacement covering providing it meets strength and fastener requirements. However, CAA cautions that a major attention regarding engineering evaluation be solely against.

Some attempts have been made to solve the problem of fasteners in applying the glass cloth over existing fabric covering, using the same fabric as a wall. CAA will approve the modification only if the underlying fabric retains the same strength that would be required if there were no covering over it.

The CAA will consider the airplane as an aircraft until the underlying fabric has lost its original strength in the glass cloth is fastened independently to the underlying structure.



Sidewinder in Operation



Defense Abandons Turbine Metal Quotas

Washington—Quota restrictions on the use of metal in the manufacture of critical, tactical, electronic, communications, and defense equipment have been abandoned.

In place of the controls, the Defense Department now requires the Army Navy and Air Force to report annually

Manufactured Sidewinder: Navy's new air-to-air guided missile, a new operational with Attack Squadron 46 aboard the USS Kidd (DD-563) in the Mediterranean and Fighter Squadron 211 aboard the USS Ben Hagen (DD-563) in the Seventh Fleet in Western Pacific. Navy uses missile about 9 ft. tall with fin at nose and tail has five moving parts and no moving electronic components such as turbine, valve. Sidewinder is loaded, disarmed, and delivery system, in loading, from one level to another over 10-20 ft. Sidewinder reached by Dr. W. E. McLean, new technical director of Naval Ordnance Test Station, China Lake, Calif., in published by Photo Corporation's Graphic and Industrial Division, Philadelphia.



how much of the six materials has been used for production and development of each new turbine engine model. The reports must be submitted to Frank D. Newbury, Assistant Secretary of Defense (Engineering).

Purpose of the new controls, according to Newbury, is to provide a warning in case the supply of the materials goes down, the level considered essential for mobilization purposes.

Newbury emphasized that the new

system does not ease the pressure on the current and future construction to ensure conservation of the six metals. It does mean, however, that reserves are now considered adequate for mobilization purposes in view of the demand for engines under development in production.

Newbury said quotas will not be used again unless there is threat of a shortage. The new instructions replace one issued in July, 1955.

Jet-Flap Research May Hold Key To Transport Runway Problems

By Evert Clark

Langley AFB, Va.—Work under way at the National Advisory Committee for Aeronautics' Langley Laboratory indicates that jet-augmented flap can be applied to jet airliners sooner than expected.

On the military side, research also indicates that "insulating" in the sub-structural method of virtual isolation for high-performance aircraft. The tail-actuator principle has been tested as propeller driven aircraft and is now being tested with jets both in dynamic models here and in the F-16 N-13.

Although more pressing problems are getting greater attention here, research on an optimizer about the use of jet flap for transport—primarily because of a new technique they resembled upon us trying to test an engine technique.

At least some of the designers of the upcoming generation of jet transports have known the results of NACA's preliminary studies since early last summer.

Dynamic testing of the new technique, described briefly in the Oct. 11

issue of *Aeronautics Week* (p. 27), will begin soon with a scale model running the Boeing 707.

New Jet-Flap Works

Early analytical studies indicated that use of the NACA principle on a jet transport with a 300,000 lb takeoff weight and a 3,000 sq ft wing area would cut takeoff from 3,500 ft to 4,000 ft, and takeoff speed from 170 to 115 mph. With a 200,000 lb landing weight, landing distance would be cut from 7,000 to 3,700 ft and speed from 115 to 80 mph. Therein is three orders of magnitude of improvement.

Greatest advantages of NACA's technique—deflecting the exhaust from the potted engine upwards and sideways over a small-chord flap at the wing's leading edge—was relative simplicity, safety and the one with which it could be incorporated into design now, as the drawing boards.

The principle, which will test the prototype in 6 to 8 ft long and in configuration is generally similar to the Boeing 737, except that it has two pairs of double potted engine exhaust

from the 707's four individual pods. NACA described it as a 1/8th scale model of a 300,000 lb transport, which would make the length of a half-scale aircraft of this design between 120 ft and 140 ft. (The Boeing 707-120 will be 140 ft long, weigh more than 258,000 lb takeoff weight and have capacity of greater than 100,000 lb. The 737-100 is 120 ft long, weighs 170,000 lb, has a maximum gross weight of 200,000 lb, and will be able to fly 1,800 mi.)

The high wing is deeply sweptback and has a high aspect ratio. The deep fuselage has a straight upper low and belly line that breaks sharply upward toward the tail starting at about two-thirds of the distance aft. Nose is small in the Boeing 737. Fuselage cross-section is a "double bubble" type. Tail surfaces are swept and a dorsal fin is used.

'Accidental' Discovery

NACA discovered the technique in a new testing while attempting to replace a method tried earlier by the British—using small jet engines inside the wing to produce a flow through a narrow tail-pipe slot at the trailing edge.

When NACA researchers considered building a small model, they looked the slot at the rear of the wing would have to be 100 to 100 ft. The difficulty of building such a model led to the suggestion that the exhaust be piped out the bottom of the wing and

First Douglas C-132 Details

Los Angeles—Douglas C-132 helicopter transport designed for Mach 0.5 cruise and top speed above Mach 0.6 will have more than 100,000 lb. Maximum payload is 100,000 lb, with no standard payload of 200,000 lb, it will be able to fly 1,800 mi.

The high wing is deeply sweptback and has a high aspect ratio. The deep fuselage has a straight upper low and belly line that breaks sharply upward toward the tail starting at about two-thirds of the distance aft. Nose is small in the Boeing 737. Fuselage cross-section is a "double bubble" type. Tail surfaces are swept and a dorsal fin is used.

Forward part of the C-132 will be four Pratt & Whitney Aircraft T37 turbo-prop engines, and at 14,000 sq ft.

Max loading gear will have 16 wheels to keep footprint pressure down to our test limits.

Details of the design were shown on a computer slide at a brief meeting in the Los Angeles World Airport Council.

forward means is, means of a number of small L-shaped tubes.

Flow from the tubes was to be directed downward by a flap. The researchers' assumption led, in turn, to the idea that the flow from potted engine—also and more popular with the transport—could be used.

The NACA and the exhaust flow will spread upward, once when it hits a deflector at the top of the engine and again when it hits the flap, giving "a sufficiently large amount of lift." In addition to lift, the NACA tech might possibly would have their air deflector.

• Cut landing gear weight, if it is found that jet augmentation can be used on all takeoffs and all landings.

• Eliminate need for thrust reversing. Most thrust reversers studied so far would add significantly to weight problems and possibly affect stability.

• Cut down engine noise, one of the major problems of the jet transport age. If dumping more of the engine exhaust does not lower noise directly, it should at least contribute by helping aircraft get off and climb more quickly.

Disadvantages may include:

Feasible Disadvantages

• Some weight penalty. In addition to the small amount of weight added by deflectors at the tailpipe wings and flaps may need some strengthening to take care of heat and structural stresses. NACA's early studies did not take into

account the penalty—at least partly because it might be offset by lighter landing gear.

• Use of deflector on all four engines at a low jet transport might introduce stability and control problems. If so, deflector could be used only on advanced engine—giving less augmentation but also reducing stability problems and increasing safety in landing two engines to provide only forward thrust and directional stability.

Since jet augmentation's greatest value would be to solve the problem of longer and longer runways, once partial application would be worthwhile. One NACA colleague and cutting runway lengths from 5,000 to 3,000 ft to approximately 7,000 would be a tremendous air savings.

Use of onboard engine only would eliminate the need for a long tail to provide balance and avoid complex low loading up of the wing.

The augmentation of lift is most useful directly under the center of gravity or as close to it as possible. Use of double potted engines slightly ahead of center of the wing—as in the NACA dynamic model—might provide a way to use all four engines for lift and also maintain stability.

The NACA technique could be applied to potted engine military aircraft such as the B-52, B-47 and KC-135, as well as to transports.

Fly with smaller military aircraft, specifically a high performance or air situation plane, the NACA is considering use of a deflector consisting of a

removal of various located under the flap at a point below the wing.

The deflector, located fairly with the fuselage down right would be angled downward into the exhaust flow from a single jet engine for landing and take-off, giving an almost vertical lift. This is a new, long, heated, high, a dynamic model approximately 4 ft long.

Because the engine must be shut enough for the exhaust to leave the engine about and was back on the landing, engine could not be used with high performance fighters and other aircraft.

Convair to Simulate 100,000-Ft. Altitudes

Environmental test chambers to simulate altitude up to 100,000 ft and temperatures from -200° to plus 500° will be constructed at the 14 World Tech, plant of Convair Division, General Dynamics Corp., Fort Worth, on the 52 million facility to begin this month.

The new facility will have both equipment and test buildings, and the test building will house three test cells, a control room, an instrumentation control and a control room. The equipment building will house compressors, refrigeration equipment, heat exchangers and other auxiliary equipment to supply the test chambers.

With all the buildings will be reinforced steel plate, with 17 in. thick insulation wall being. Completion is expected during 1975.



Various Hawker Hunters

Five versions of the Hawker Hunter being flown by the Hawker test pilot association here. In the formation are the two-seater Hunter T-7, leading; Mark 6, second with Foxback potted engine; night fighter, Mark 6 with atmospheric wing tips; the long range fighter, Mark 6 with long range version; one with two long-range pods and 14 inch potted; Hawker's new version, which has standard atmospheric planes to fly on change engine role.



New Rocket Drone

Rocket Drone Co. of Van Nuys, Calif. developed new rocket powered target drone. RP-78 designed for weapon system evaluation and training at Mach 0.6 to 0.8, 10,000 ft. Vehicle is powered by a solid propellant motor with 5 to 30 min. flight endurance. Air frame, weighing 100 lb., is 9 ft 9 in. long with wing span of 5 ft. Structure of fuselage is steel and motor is steel, but other primary structures are made of glass fiber and reinforced plastic. Plastic wings, horizontal and vertical stabilizers, are fixed. Drive is controlled by small control rudders (moved) of the wing. Inert directly to flight control system. RP-78 is made for flight test. Rocket Drone subsidiary of Northrop Aircraft, Inc., is engaged in research and development of ground missiles for USAF.

Douglas Aircraft Co. backlog of aircraft orders amounted to half the company total orders for the first time in its history as new orders poured in. Sept. 10 backlog total was \$2,279,642,000. Third quarter net earnings were \$21.9 million, equal to \$5.95 a common share as sales of \$711,355,996 for the same 1955 period earnings were \$21.1 million, or \$5.31 a share, on sales of \$679,157,513.

Jepson's first practical experience with tunnel was tested successfully at Idaho University's Scientific and Engineering Institute. Construction running tunnel for fundamental research on boundary layer and turbulence, has a 490 hp

engine capable of generating speeds from Mach 1.5 to Mach 3.

Five Canadian-built Grumman C52H Tracker was delivered to Royal Canadian Navy by the Hamilton Aircraft of Canada, Ltd. Plans will go ahead for new Canadian carrier Development scheduled for commencing in June, 1956.

Spern Reed Corp. facility at Plattsburgh will be called Spern Plastics Company. Division of Spern Reed Construction of \$2 million plant on 480-acre tract will begin soon.

Squadron of 35 North American F-100 Super Sabres completed 4 hr 55 min nonstop Atlantic Ocean crossing. One aerial refueling was made in deployment of planes of 45th Fighter

Des Wing at Fuis Air, Tex. to London's Germany, via San Francisco, French Maines. Average speed was 678 mph.

Convair 440 deliveries are leveling off at eight a month. October deliveries include three for Robert Belgian World Airlines, two for National Airlines.

Boeing Air Force will host two Vietnam Veterans and two English Electric Canberra with Canadian Experimental and Proving Establishment detachment this winter at Nanaimo, Canada. Purpose is to give cross experience in continental flying in winter conditions.

Safety awards for accident-free years have been given to Republic Aviation Corp. and Cessna-Wright Corp. by Liberty Mutual Insurance Co., which is an industrial employee insurance company.

French aircraft industry backlog of foreign orders stands at 178 aircraft worth \$96 million. Orders amounting to approximately 550 million are now under discussion.

Teneco Aircraft Corp.'s Convair, Tex. plant was awarded a half million dollar contract for extension of previously related aircraft and parts for TB-29 aircraft.

Convair Division awarded Alcoa Manufacturing Co. add-on contract of \$7,667,000 for aircraft control surface parts for Convair F-102A. Production will be at Alcoa's Government Products Division, Downey, Calif.

Southwest Research Institute's new \$675,000 facility at San Antonio for hydrocarbon industries research by Post & Whitney is to be completed before end of year. Research is in connection with P&W's engine control populating program.

CAB assigned investigation team to delivery of Pan American Boeing Stratocruiser last week 1:140 mi out of Pacific Ocean. Coast Guard Cutter Fincham, AF 32 persons aboard was used by cutter. Plane, which lost two engines, remained aloft approx. 20 minutes despite being sighted in full contact.

Receipt of a \$70 million order from Navy for WV-2 Super Constellation radar planes increased total radar contracts awarded Lockheed Aircraft's Cockburn Division, as the past three weeks to nearly \$140 million. The WV-2 order, the fifth placed by the Navy, will exceed deliveries of the radar planes through 1958.



Snecma's Flying Turbajet

Four engine photo of Snecma's Flying Jet shows wingless aircraft operating under a 115 ft. push. Unit includes an Air Turboprop engine of 6,300 hp thrust, fuel tanks and control equipment, weight 5,600 lb including fuel. It can take off vertically as heavily, with jet blast deflected out to starboard. Unit is controlled remotely by pilot from radio shack. Cables are for safety, company ops, and do not assist aircraft.

NEW from EEMCO

A 400 Cycle AC Linear Actuator
with an operating range of
320 to 480 cycles



SPECIFICATIONS FOR TYPE B-41E

No load operating load: 4000 pounds
Maximum operating load: 12,000 pounds
Minimum stroke load: 21,000 pounds
Stroke: 3 1/2 inches
Rate of travel: .23 inches per second
Accuracy: 3 mm at 400 cycles and 200 mm at the 4800 lb load
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Qualification: Type C-41E has been designed and qualified to meet application military and aircraft manufacturers and specialist users.

EEMCO 400 cycle linear actuator Type B-41E

is being established as a leading edge linear actuator in the latest and fastest super sonic fighter aircraft now being produced for the U. S. Air Force.

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EEMCO is a specialist in the design and production of precision built actuators and motors. The majority of the latest and fastest aircraft and missiles being produced for the U. S. Department of Defense carry out or have EEMCO systems. Industry, too, is using EEMCO linear and rotary actuators where precise control of mechanical actuating systems is imperative.

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TRAIL BLAZING—Many frontiers of science have been charted by Northrop

Aircraft engineers and scientists in successive years of research and development of manned and pilotless aircraft. Northrop's sleek S-55B, the first conventional guided missile to be adopted by the U. S. Air Force, are now flying from the Florida coast over the USAP in mid-air test range. Northrop's newest trail blazer is a supersonic trainer designed to help pilots master the complexities of tomorrow's combat aircraft. Other Northrop trail blazers include Scimitar P-29 interceptors; platform target aircraft; and missiles from Northrop's subsidiary, Raytheon Company, given development and armament equipment from the Avianic Division, and, certainly new concepts of integrated weapon systems which are presently being submitted to improve our national defense.



Pioneers in All Weather and Pilotless Flight

AIR TRANSPORT

Winter Transatlantic Air Capacity Hiked

By Glenn Garrison

New York-United States and foreign flag airlines will offer about 23% more transatlantic seats this winter than flew during the 1974-75 winter period, an Airline Wreck survey discloses. While total capacity will vary in some schedules as slotted during the season, the scheduled carriers will produce an average of about 38,530 seats a week from North America to Europe.

Many of the seats will be in brand new equipment, and more of them will be in combination-class aircraft than last winter. About 128 flights a week in each direction will be offered by the carriers compared with a weekly average last season of about 153 flights.

Wife and a long haul of the 15-day overseas line embedded last just by International Air Transport Association are enjoying embarking package tour in the new line, setting up new packages within the economic frame work, and offering "do-it-yourself" plans to travelers who want to work out their own low fare itineraries.

Notable newcomer to the transatlantic winter season is the Douglas DC-7C, already in use by two of the carriers and scheduled for service by two others before the season is out. Other airlines have put new Constellation Super G equipment on the line. The 10-10A Constellation, on order by two other carriers, won't make its first appearance until next spring. Pan American DC-6s and DC-6Bs, Super Constellation, Stratosferers, DC-8s and a brand-new DC-8A will provide the rest of the winter production.

Combination Flights

Because of only 16% in number of weekly flights, while seats are up 21%, growth from the last that almost all the additional flights are combination, with a reduction in all first-class flights, following the lead in that direction last winter, the airlines averaged 49 first-class, 32 first-class and 79 mixed flights weekly. This winter, the split will be 33 first-class, 15 all tourist, and 19 mixed flights per week in each direction.

Outstanding exception to this development is KLM Royal Dutch Airlines. Last year KLM flew three one-destination schedules a week, plus four each of alternate and England. This winter, the Dutch carrier has taken off all its mixed flights and offers seven all tourist and seven first-class weekly.

The airline says the change was made possible by the additional frequencies, amounting to daily service for each class of traveler. Handling only one class of passenger makes things easier for the crew and better for the dispatches carriers than mixing types of service, according to KLM. The airline's seats structure, of course, is feasible to this kind of transatlantic scheduling.

KLM's transatlantic equipment, all Super Gs this winter, carries 17 in first-class, 79 in tourist configuration. DC-7Cs are due next summer.

Mixed Arrangement

The American carriers, on the other hand, have shifted strongly toward the mixed arrangement. Pan American World Airways offers 49 weekly flights this winter, up an eight from last season. Of this winter's total, 28 are mixed, 19 first-class, and seven all tourist. Last winter the flights were 38 mixed, 36 first-class and seven all-tourist. This year's capacity will average about 1,636 seats weekly each way, up from 2,577 last winter.

Pan American uses Stratosferers for its first-class service, offering 49 passenger and DC-7Cs, DC-7Bs, and DC-8Bs for its dual and tourist flights, the dual configuration running on different flights.

and the all-tourist version, using 72. From World Airlines flights will average about 31 each way per week during the winter, split 13 mixed, three first-class, and 15 tourist. Last winter TWA flew five mixed, 41 first-class, and 19 tourist schedules. Carrying 49 passengers in combination for most flights, 30 on first-class, and 19 on all-tourist, the airline will produce about 1,590 weekly seats in its Constellation and Super G Constellation five weeks. This is a 3.2% increase over last winter's capacity, another of weekly flights is one less than in 1974-75.

TWA has shifted more heavily to mixed schedules because of the additional frequency possible for each type of traveler and for the higher overall load factor the combination configuration produces in its various routes. The airline expects to open its Constellation 10-10A equipment on the new route next spring.

Reminders of the North Atlantic scheduled airline picture for this winter. As Pan Am expects to offer 17 flights, all mixed, up seven from last winter, which also will be mixed. The carrier's Super Gs currently will provide 14 tourist seats, 20 mixed seats, four berths (eight passengers). Two of the schedules still tentative at this point.



Ford Flies to Moscow

Ford 1957 model sedan, about to be loaded aboard Pan American World Airways Clipper at New York International Airport. Auto loaded up on streets of Moscow on Oct. 1, two days before was loaded aboard in New York. It was consigned to U. S. Embassy, unloaded at Helsinki, loaded and placed on Russian rail car for Moscow.



FAST 3445A. Constellation taking off from Lockheed Air Terminal and en route to London. Flight was first test of new 344C wing, 27 ft. greater than previous Super Constellation. Aircraft is in production at Lockheed for Trans World Airlines and will go into service next spring and summer on the transatlantic as well as domestic flights.



are among seven through flights, all via this service, to Middle East destinations. Two of Air France's weekly flights will continue to depart from Chicago via Canada to Paris.

The carrier has 1647As in order, expects first deliveries in June.

• **British Overseas Airways Corporation** will offer 17 flights a week, one non-branch and eight first-class. Shuttle cruises will handle all flights until toward the middle of January, when DC-7Cs will be phased into new, first-class schedule. The round flying flights will carry 50 tourist and 17 first-class passengers; first-class Strathmore will accommodate 38 passengers. The

DC-7Cs will carry 48 passengers first-class.

BOAC last year dropped its Chicago service for the winter, then resumed all routes once weekly Chicago departure a combination flight. Five of BOAC's weekly flights will depart from Montreal, one of them first-class.

• **El Al** Israel will, as last winter by its two 60-passenger Constellations, both in tourist configuration. The airline hopes to get first of its Bristol Britannias in mid-October.

• **Boosa** schedules will resume until early 1957 at two flights, both of them round Super Constellation configuration carrying 31 passengers. Delivery of

Super Cs next year will permit a schedule increase.

• **Europe Airline** Italian's flights have increased from three to four for the winter, all of them round.

LA's DC-6Bs carry 57 tourist and 16 first-class passengers; its DC-6s carry 40 and 14 respectively.

• **Lufthansa** Lockheed Airlines will add four 52-passenger DC-4 tourist flights at all season rates lower than the 147A's excursion lines. Last winter Lufthansa flew three winter schedules.

• **Lufthansa** North Atlantic schedules are up from last winter to eight, all of them round and two of them from Chicago. The West German

carrier's equipment is Super Cs, seven seating 16 first-class and 49 tourist passengers; in its range. Lufthansa's domestic connecting services have been expanded to serve 10 major terminals covered with two fast jets.

• **Scandinavian Airlines System** offers the same total of 13 weekly flights in last winter, but seats have gone from 50 to 675 per week, an 11% increase. All flights are round, whereas first winter SAS flew two first-class schedules. The airline is using new DC-7Cs for seven of the flights with 44 tourist seats, eight sleeper seats and eight "cabinets." The other four flights are DC-6B equipment with 46 tourist and eight sleeper seats.

SAS also has stepped up its trans-pacific winter flights from three to five weekly, and DC-7Cs have replaced DC-6Bs on the route.

• **Sabena** Belgium Airlines has added one schedule for a total of seven a week, all round and all but one is DC-6Bs with 12 first-class and 47 tourist seats. The seventh flight is a tourist-only DC-6A carrying 18 passengers and up to four tons of freight. Its curbs limit on Sabena's eight DC-7Cs into trans-Atlantic service. The airline has also increased its inter-Europe services with Constellation 44s and is adding Sikorski S-75s to its helicopter network.

• **Swire** begins the winter season Oct. 25 with five DC-6B schedules, one of them first class and the rest combination tour. Constellations are 36 tourist seats, eight berths (12 passengers) in round, 25 seats eight berths in first class. Beginning Dec. 10 Swire will start placing its DC-7C equipment, carrying 47 tourist seats, eight berths and a lounge in the weekly 36 seats, eight berths and a lounge in the first-class version. By Feb. 3, Swire will be offering an DC-7C schedule weekly.

Last year's winter schedule totaled five flights, one of them first-class.

• **TWA** Canada Airlines will provide seven winter schedules from Canada to Europe. Equipment, all of them round versions seating nine first-class and 54 tourist passengers. The total represents an increase of one flight over winter 1955-56.

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Jet Engine Maintenance Symposium for Airlines

Twelve APM-Symposium for airline personnel on jet engine maintenance and overhaul by JET, JET, JET and TWA airlines engines is being held here today, tomorrow and Wednesday. Symposium is sponsored by the Air Transport Association, is sponsored by GILLESPIE Air Material Inc.



Medium Range Friendship

Fisher T-27 Friendship when membership is U.S. under license by Fokker Engine and Aviation Corp. They mean: 500 short in medium range, out in a 32 to 40 and return with 1,000 lbs. Roll-Roll Dart turboprop engine. Turboprop version is priced at \$440,000.

TCA, meanwhile, offers no more than under the IATA 15-day excursion plan, just offers 48 customers for the rates are available.

Examples of other plans:

• A \$350 package tour plan lasting 16 days (including time of hotel) on Bag

land, Scotland and Ireland (Siberia), Paris and London for \$470 (Pan American).

• A \$740 cruise along through three to five European countries at package price of \$544 to \$767 (FVW).

Braniff DC-7Cs Enter Service

New York-Braniff International Air now plans Douglas DC-7Cs into domestic service has selected an area of its schedules over New York, Los Angeles and Chicago-Texas routes.

Originally, Braniff intended to use its DC-7C El Dorado service on international routes to South America. Company's first airline flying DC-7Bs and Super Constellation from Texas service found a change in these plans.

Braniff now expects to put the DC-7C on South American and east coast gateway in late in early June.

Braniff's first El Dorado schedule will be one round trip daily on each of these routes: New York-Dallas-New York-Dallas-New York-Chicago-Dallas and Dallas-Houston.

Non-stop schedule between New York and Dallas is 4 to 48 non-stop round and 1 to 21 non-stop round. Braniff's DC-7Cs have not been modified for the shorter range duties.

Braniff's DC-7Cs (twice) are an order with two delivered all are arranged in combination first-class berths. Service first-class accommodations are located at the main cabin entrance and buffet lounge section.

The other 12 are between the San

and Houston and the cockpit. This places the 35-seat tourist compartment between the buffet section.

The arrangement brings the stewardesses to pass through the tunnel cabin when providing service to the first-class passengers in the forward compartment. Some Braniff personnel anticipate that this will create a load situation, but the airline is prepared to move the entire forward area ahead of the buffet lounge into a lower class arrangement.

Shippers Urged to Use Air Cargo Services

Chicago-McCord Lippert Air International president told shippers last week that it was possible to save for a "discount" on flights with air shipping costs because today's planes meet most air cargo requirements with "barely" in both airline co-terms and business profits.

In an address before the Chicago Area Air Commerce and Industries, Lippert and general misunderstanding of an airplane's cargo capacity has a linked or growth.

"Many shippers," he said, "don't see air freight today, simply because they don't realize what it can offer in the way of life."

Stick Move

Barbuck, Cold-Wick Airways will move its general aviation offices from Barbuck to Dallas. The move, scheduled to begin Nov. 15, is designed to expedite communications between Barbuck and product dealer Jetstream-World International. Close proximity to Washington, D.C., and location in the central time zone were cited as advantages of the new site.

Stick's Barbuck terminal and prime maintenance base will be acquired and expanded. The company also is studying major metropolitan areas which may be served by flights from the new airport, such as New York, Newark, Fort Worth, Dallas, and Los Angeles-Barbuck.

The airline reported a record 4,818,670 total of passenger carrier revenue this year, started in September and a 13.9% growth to \$2,674,707 ten miles during the third quarter of 1956. The Barbuck terminal handles 75,000 pounds of cargo daily according to Stick, and a 50% to 60% increase is expected within two years.

Overall Subsidies For Airlines Drop

Washington—Annual subsidies report for U.S. airlines shows that subsidies payments are continuing at a downward trend and will have dropped 10% between Fiscal 1954 and the end of the next fiscal year.

The Civil Aeronautics Board's report estimates subsidy for Fiscal 1955 at \$44.4 million and says all domestic trunklines and all transoceanic and nonspecific operations will be self-sufficient.

The subsidy estimate for fiscal 1955 is down \$39.5 million from the total for 1954, the first year any such subsidy aid service had been required under Reauthorization Plan 10.

Lengthy carrier subsidies will be up 11% to \$26,077,000 in the four-year period, but the fiscal 1955 estimate is down slightly from the \$27,087,000 total for the current fiscal year.

Subsidy for helicopter operations will have increased by 35% between fiscal 1954 and the end of Fiscal 1956 to a total of \$4 million. Developmental "seed" subsidy will have decreased from \$8.3 million to \$7.4 million and its own airline subsidy will have decreased from \$499,000 to \$281,000 in the same period.

Subsidy of \$59 million is forecast for Latin American operations in Fiscal 1956. This represents a 64% drop from the Fiscal 1954 total of \$163 million and a slight drop from the \$57 million estimated for Fiscal 1957.

TWA to Gain Jet Data With 'Paper' Program

Washington—Trans World Airlines will conduct a series of theoretical jet transport flights to gather jet operational data on its transcontinental and transatlantic routes. Part of the series' flight logs will begin within the next two months.

The airline will schedule the flights as though they actually had been in operation under the company's daily operation. Flights of the "fiction" program will be conducted under actual jet flight procedures by TWA's dispatchers in their work regular daily flights.

The company and the jet transport operators in relation to offer traffic under current weather conditions that will help make the jet "right" into TWA's last with a minimum of problems.

The test program is under the direction of Paul Frobenius, director of flight operations and chairman of the airline's 19-year jet planning committee. In addition to the simulated flights, the committee is conducting research with the Air Force, manufacturers and other airlines in preparation for General 595 jet transport service planned for 1959.

CAB Proposes Rules For Emergency Exits

Washington—New aircraft construction rules were proposed by the Civil Aeronautics Board to cover new, high-capacity turbine transports and other designs or configurations.

The proposed regulations would bring general rules up to date and provide for transports with capacities of up to 239 passengers.

Under the proposal, which has been submitted for industry comment, transports would be required to have an emergency exit in the right side area large enough to permit rapid evacuation. Transports designed to carry up to 23 passengers would be exempt from the rule if passenger exits were close enough to the rear area for effective use.

The CAB draft of the new regulations specifies four types of emergency exits:

• Type I would be a rectangular opening at least 24 in wide and 48 in high and would be a floor level exit. The first Type I exit would be as far as possible toward the rear of the aircraft as required for maximum effectiveness in emergency.

• Type II would be rectangular and not less than 20 in wide and 44 in high. It would have to be at least 10 ft and

placed over the wing or which must at least have a 25-in. or 26-in. wide and 10 in inside the fuselage and a maximum step-down of 37 in outside. The Type II exit would also be placed as far to the rear as possible, with other exits placed for maximum effect.

• Type III exit would be a rectangular opening not less than 20 in wide and 36 in high. If located over the wing, this exit would have an inside step-down of 39 in maximum and an outside step-down of no more than 36 in.

• Type IV is specified as a rectangular opening at least 19 in high and 26 in wide with an over-the-wing step-down of 39 in maximum and an outside step-down of no more than 36 in.

The proposal contains a scale of emergency exits required on each side of the fuselage for various capacities ranging from one Type III exit for a transport with 3-19 passenger capacity to four Type I exits for a 239-259 passenger transport.

For deterring the rules would apply at least one emergency exit located above the water line for every 35 passengers that are carried.

Delta Revenue Increases 13% Over Last Year

Delta Air Lines reports gross operating income of \$66,600,000 for the year ending June 30, 1956, an increase of 13% over the previous 12-month period. Income totaled \$7,973,600 for the 1955-56 period and net income after taxes was \$4,369,999.

Operating expenses for the year increased 10% to \$58,626,400 according to the report. Delta carried 2,261,779 enroute passengers a total of 1,850,267, 800 non-enroute during the period.

Available seat-miles totaled 1,716, 640,000 and the passenger load factor was 62.5%.

The airline flew 181,544,000 revenue ton miles during the year and the overall load factor was 57.19%. Earnings per stock share was \$4.70 and dividends amounted to \$1.10 per share during the year, Delta reports.

Cooperation

New York-based Delta Air Lines president, William H. Allen, said that the transportation industry will mark that destination more only through an arrangement between the airline and the Puerto Rican Railroad. FRR will accept Delta tickets for air transport money.

The program will operate at Philadelphia's cross country for two line and tickets to New York on the railroad. Both companies use the same type of information including schedules.

CAB Adopts Emigrant Fare Plan

Washington—Civil Aeronautics Board has reversed itself to approve a carrier emigrant fare plan proposed by the North Atlantic airlines of the Civil Aeronautics Board of the International Air Transport Association.

The Board approved the new emigrant fare for a three-year trial after approving the plan at the time of a tentative decision in August (AW Sept. 1, p. 15).

At the time, the CAB upheld its decision against allowing Eastern Air Lines to raise its Washington-Buenos Aires fare by the rate of the Washington-New York fare. Eastern operates its Washington-Buenos Aires flights via New York.

Nothing in the position on the new program, the Board said, indicated very little of the emigrant traffic between Europe and Canada and the United States traffic by scheduled airline. This traffic amounted to approximately 200,000 passengers in 1955.

The new fare provides a 40% reduction during the off-season for emigrants from Europe to Canada or the U.S. Proponents of the fare argue that it will lure emigrant traffic from the scheduled airlines and increase seasonal traffic imbalances.

CAB said that, where European emigrants with strict government visa requirements are a clearly definable class, which is not subject to the same volume but on the granting of reduced rates cannot adversely affect other travelers and non in the long run, help reduce the general fare level.

Added to the economic basis for reduced fares for that particular class of travel is the fact that, historically, emigrants or immigrants have been the object of special government concern and consideration, the CAB said. The Board also said that other airlines have expressed strong interest in facilitating movement of emigrant traffic.

Italy and Spain were excluded from the emigrant fare plan of their own request, so the fare does not apply to emigrants from these two countries or to nationals of Italy.

CAB Vice Chairman Joseph E. Adams called the fare discriminatory on his dissent. He said he doesn't know that but "not at the expense of leaving back abuses of the equal treatment principle." Adams feels the cushion of Italian and Spanish emigrants would be the fare even more discriminatory.

CAB Member G. Joseph Morici also dissented. He noted that nationals of other European countries are not able performed over Italian and Span-

ards and said that this fact sufficient grounds for disapproval without Italy and Spain acquired the discrimination of not.

Morici pointed out that the carrier fare will not provide transportation in an economical form as these already available on charter flights. He also said the fact that the fare is available only in the off-season indicates that the airlines are more concerned with filling empty seats than with helping emigrants and that this type of prohibition does not survive appeal.

Life-Preserver Rule Proposed by CAB

Washington—Civil Aeronautics Board is planning to require life preservers for all passengers at standard equipment on transoceanic flights. The proposed rule would require all transports, except those already equipped for overseas operations, to carry an individual life preserver or flotation device for each passenger. The CAB wants the rule to go into effect within a year from the date of adoption.

Life preservers would be constructed of inherently buoyant material providing a buoyancy of 164 lb and would have to be located within reach of each passenger and be easily accessible. The device would have to be equipped with arm straps or some other non-steady of holding on to it. CAB's Bureau of Safety Regulation

proposed the rule after the recent ditching of a Northwest Airlines Super Constellation in Puget Sound, which came to rest, and after a study of 12 other crashes on water which claimed a total of 15 lives.

Currently, transports on extended over-water flights are required to carry emergency flotation gear for passengers. In the past, this type of gear has not been required on over-water flights since the risk of ditching was not substantial enough to warrant making the airlines even, and potential life preservers.

Now the bureau feels that the development of suitable material provides a means of saving most survivors, possibly, blankets and similar items. However, the bureau notes that such items can be used for life preservers by equipping them with arm straps or other means of keeping on to them.

Since such flotation devices would not be added equipment which would have to be maintained and inspected, and, in view of the recent Puget Sound accident, the CAB now feels that a requirement for some sort of life preserver on all water transports is reasonable and necessary.

Northwestern University Opens Transport Center

Evanston, Ill.—The airline industry will be represented on the 25-man advisory committee of a new transportation center opened this month at Northwestern University. The center is aimed for a fresh and integrated approach to transportation problems of "world's interconnecting complex." The center will provide research and con-



IATA President

Lord Douglas of Kilmorlie, president of International Air Transport Association, stands at podium at the 1956-57 annual meeting of the association at Edinburgh, Scotland.



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Aviation officials on the advisory committee are: W. A. Patterson, president of United Air Lines; Stuart G. Tapscott, president of Air Transport; Fred D. Johnson, senior vice president of General Dynamics Corp.; and Robert E. Coon, president of Lockheed Aircraft Corp.

**Lake Central Awarded
Portsmouth-Case Route**

Washington—Civil Aeronautics Board announced last week that it will award a new 6000-hour local service route to Lake Central Airlines in the Portsmouth Service Case.

Lake Central will be authorized to operate over a new route between Cincinnati and Columbus in Portsmouth for a period of three years or until the CAB reaches a decision in the Great Lakes Area Local Service Case, whichever comes first.

The CAB announced its decision in a press release. The route will become official with the subsequent release of a formal opinion and order.

SHORTLINES

► **Aerways**, Colombian National Airways, will operate nine Super G Constellation flights a week between New York and Panama this winter, including two all-transport flights via Miami.

► **British Overseas Airways Corp.** is studying transfer of cargo at London Airport through a streamlining of customs formalities. Documentation has been eliminated, and new simplified procedures allow more rapid transfer of cargo between aircraft and among airlines at London.

► **Central African Airways** now has tail-finights at Rome for its Rhodesian Viscount service. The Rhodesian Viscount service, begun in Feb., operated with a passenger load factor of 85% during its first month.

► **Central Airlines** began issuing credit cards last week under the Universal Air Travel Plan sponsored by the Air Transport Association. Credit cards continue to offer no-man credit cards, which give travelers a no-deposit 30-day account for travel over its routes.

► **Israel's** master plan for Ludd Airport is moving forward, led by a project to lengthen runways for jet transport use. A new radio telegraph service to London will be in operation by the end of the year.



Flotation Gear for S-55

Instantly available flotation gear, required by CAA, is fitted onto two Sikorski S-55s based in New York. Gear, designed by Shortly with bags manufactured by Air Casson Co., Division of the Garrett Corp., weighs 164 lb., sits about 35 ft. off top speed and 54 lb. off cruising speed. Pressure is 41 psi.



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year, and a pressure refueling system is scheduled to go into operation next spring.

►International Air Transport Assn. moved its headquarters last week from the International Aviation Building to larger quarters at 1063 University St. in Montreal. Telephone number and cable address are unchanged.

►L.M. the Italian airline, will operate four weekly flights between New York and Rome, Milan and Rome this winter.

►National Airlines is confirming Bar-nagle Takeover relating customers in its Miami, New York and Washington ticket offices. The airline estimates the new customers will not be taking time in a fall.

►Pan American World Airways has added Philadelphia and Boston to its grand world schedule and now offers five flights a week between Philadelphia, Boston and New York, and other San Francisco or Los Angeles. The flights are operated with DC-6Bs as far as Mexico and Tokyo, and with Boeing Stratojets across the Pacific.

►Seaside board of directors has decided to lease a 57 million bond issue bearing a 7.75% interest rate to finance its expansion program.

►Vang Airlines of Brazil has opened a ticket office in San Francisco to develop traffic in the West Coast area.



Radar Nose

Weather radar will be mounted in nose of Viscounts for Capital Airlines and U. S. Steel Corp. New nose design adds 10 to length of aircraft, will accommodate all known types of radar, including a 20 in. scanner. Type of equipment fitted can be varied by changing mounting bracket on bulkhead. Modifications that will be made available to operators wishing to fit nose radar to earlier Viscounts.

AIRLINE OBSERVER

►First progress report by the Aviation Facilities Planning Group headed by Potomac Assistant Edward Carlin will be presented in series soon, with each report on specific types of equipment will be available by March, and discussions will be confined to a consideration of an "outline of concepts for an airport system." The outline will be based upon estimates of traffic volume in the next 20 years and upon all types of equipment now available or in development. This is the first stage of the overall Carlin program which separately is dealing on schedule. Since the plan will not have reached a concrete form by the time of the meeting, it is unlikely that a formal report of progress will be published.

►Capital Airlines will sell its remaining two Viscount 746s subject to a June, 1957, delivery date when it has enough Viscount 746s to meet its needs. On the other hand, Viscount 746s purchased by Capital, one was lost in a hard-landing accident at Chicago Midway Airport. Sale of the two aircraft will bring Capital's projected Viscount fleet to 72. The airline now has 42 Viscounts in service.

►Lufthansa German Airlines will take steps to prevent the use of its emotionally registered air name by the East German line, which also goes by the name of Lufthansa. Legal action will be taken despite company belief that the flag of a communist in coats of airline countries will be futile.

►Southwest Airlines has applied to the Civil Aeronautics Board to change its corporate name to Pacific Airlines.

►First scheduled domestic service in Southern Ontario is now being operated by Canadian Aircraft between St. Catharines, Welland and Toronto. Canadian plans to add DC-3s to its present fleet of Cessna 440s, Beech C-45 and Cessna T-50 equipment.

►Quantas Empire Airways last week took delivery of its first 10491R Super Constellation, their series ahead of schedule. The aircraft will be fitted temporarily with 92 seats to handle Olympic games traffic, later will be modified to a combination passenger/cargo configuration.

►Fincham plan sponsored by the Air Traffic Conference to reduce the number of aircraft passengers (AW Stat. 17, p. 39) has been moderately successful, according to several airlines. One airline reports a 5% reduction in its claims, but the majority of companies participating in the conference agree that the problem will be substantially reduced only after maximum positions are introduced.

►Air-India International has decided on Rolls Royce Conway bypass engines to power the three Boeing 747s it plans to introduce on routes to Europe and the U.S. in 1960.

►Hornet Airlines last week introduced an DC-7C schedule with a series of domestic, local and international flights in New York, Washington, Minneapolis, Chicago and San Antonio.

►Lockheed's sales staff is back on the road pushing Electra sales after a completed period of questions. The company had down its sales pitch while airlines took time to evaluate the wide-range Constellation 350 design and Douglas DC-9 and Boeing 727 projects. Lockheed now feels that airlines have a chance to review their equipment needs and are therefore ready for the next sales talk.

►BOAC last week took delivery of its first DC-7C which will go into transatlantic service January 1, 1957 on the New York-London route.

►In the 116 BOAC Douglas has sold a total of 55 different airlines has been ordered.

Cessna T-37 designed for Jet Training

To meet jet age demands, the U. S. Air Force requires a jet trainer that makes it easy for cadet-pilots to master first-line combat airplanes.

The Cessna-developed T-37 introduces the cadet to all combat jet airplane characteristics while training on this safe, easy-to-fly jet trainer.

It is designed to provide the Air Force with a jet trainer that can be operated at substantial savings and cover the most important and longest phase of the cadet-pilot's jet training.

It is a privilege for us here at Cessna to team with the Air Force in its forward-thinking plans for the jet age. CESSNA AIRCRAFT COMPANY, Wichita, Kansas.



Ready for Air Force cadet-pilots... Cessna T-37's.



Be an Aviation Cadet. Inquire today about the future your Air Force offers from your Air Force Recruiting Office.

Plane Sales Increase Flying Tiger Earnings

The Flying Tiger Line earned \$2,975,771 in net income and record income during the fiscal year ending June 30, 1956, the latest reports. Earnings, equal to 53.50 per share of common stock, compare with \$400.188 or 41 cents a share for the previous year.

Operating profits amounted by \$12,076 of the 1955-56 fiscal year compare with the \$2,693,191 balance deriving principally from sale and disposal of aircraft. Gains in traffic and operating income during the last quarter of the year offset losses experienced in mid-year according to the report.

With the fleet addition of 10 Super Constellations in 1957, an increase of 30-35% in gross revenues for fiscal 1956-57 is projected by Robert W. Zwanke, president of FTL. The line net will represent a total business volume of \$26-29 million in 1956-57, Zwanke estimates.

National Net Profit For Year Rises 39%

National Airlines made a net profit of \$4,330,143 after taxes during the fiscal year ended June 30, 1956, an increase of 39.83% over the previous year. Operating revenue was up 14% to \$55,963,244, while operating expenses rose 10% to \$49,777,799, according to National's 1955 annual report.

National earned 1,427,660 revenue passengers, 967,186,069 miles during fiscal 1955-56, achieving a passenger load factor of 85.76%. Revenue ton miles totaled 110,265,000, an average ton mile was 6,073,800, and net asset ton miles totaled 1,458,600.

fleet orders, were announced during the year with placement of four orders for 24 Lockheed Electras and six C-54s.

Available seat-miles for the period totaled 1,160,274,900, resulting in the airport, and cost per available seat-mile was 5.00 cents. First-class passenger revenues increased 7.33% to \$25,975,332, and coach revenues rose 21.57% to \$24,117,655.

Western Declares 20-Cent Dividend

Western Air Lines has declared a regular cash dividend of 20 cents a share, the fourth cash dividend this year for a total of 80 cents per share. WAL also paid a stock dividend on Aug. 30 of 4%. The airline's stockholders at a meeting Oct. 16 voted to discontinue cumulative voting at elections of directors.

COCKPIT VIEWPOINT

By Capt. R. C. Roberts



Wide Windshield

There has been more than a little discussion of late between the proponents of 100% instead of 80% visibility and those who hold with the wide windshield view. As it is often the case, each theory has certain merits but neither can be accepted in toto at the present time. Undoubtedly, however, we are in need of more reliance in the traffic control system and there are surely aircraft flying today which are not easily blended with outside visibility.

Strange as it seems, achievement of ground-level vision is not necessarily as elusive a cockpit goal. Too much glass up front can produce sensor super confusion. Matter of fact was model of a new transport now being built has been criticized by pilots at having just that—too much glass. Here is the situation.

Not So Good

The need for better vision for pilots is not a new proposition—it just hasn't received a great deal of publicity until recent months. A few years ago aviation manufacturers had new aircraft designs on their drawing boards in which provisions had been made for large, unobstructed windshields afoot. And all who were interested in this feature said, "Fine." Now several years later, as the models up, it turns out that all is not so fine.

In one sense most cockpits being built today are "standardized" affairs. That is they are supposed to conform to numerous dimension standards. First you take a "standard" pilot and put him in his seat. The cockpit controls must also fit the pilot's "standard" knees in the full back, hand-over-shoulder position. So far establishes the "standard" height of the column and the wheel.

Next we measure up from the floor a certain distance—42 inches in 1 believe, the accepted number—and we arrive at the "standard" eye level. This determines the mid-point of the windshield. By incorporating the average vision which our "standard" pilot must have down on the scale as well as up, we learn the vertical dimensions of the pane of glass and the window frame is installed accordingly.

Substantial Thickness

But since we wish to eliminate as many joints and supports as possible we window frame must be of substantial thickness to prevent the glass from blowing out when under pressure at 30,000 feet as well as from blowing in when colliding with flying debris.

So far all sounds "fine." But wait. What happened to the outstanding point? These "standard" facts have noted the cockpit column and it must include the bottom of the window frame. In order to see the instruments our real live, non-standard, pilots are going to have to peer around and under and behind the wheel to see the gauges.

The view out the window is real. Certainly we don't doubt that. But the view of the approach horizon, the approach and abutments on a low approach more nearly resembles a peep show. Not so fine. As one pilot quipped, "This makes for a real good driving record."

Perhaps this all goes to prove that you can't please everybody. But the point I am trying to make is that pilots of large transport type aircraft necessarily must consider other factors besides a positive window. Outside vision of very high altitudes, in short-circuit, data when an instrument, and within a clear view of all flight instruments is available low approach can be hazardous. So next time someone complains of "too much cockpit" be sure not be living entirely blind.

BRISTOL'S HISTORIC

"OPERATION CLOCKWORK"



The exclusive log-book record of the Bristol Britannia's recent U.S.-Canadian tour... how the "Whispering Giant" made an extraordinary flight operation possible.

Ninety minutes before midnight, Sunday, August 12, a new Bristol Britannia turboprop airliner swept down a London Airport runway en route for Montreal.

Arrival: *Baker-Jig* was fresh from the production line. Tests of duty-free Britain were being held for B.O.A.C., she had logged exactly twelve hours' flight time before takeoff. Aboard were a special Bristol demonstration team set to show U.S. and Canadian aviation experts what their "Whispering Giant" could do.

This was the beginning of a historic tour that went like clockwork all the way. From the flight log, here are examples that highlight the remarkable achievements of this unique flight operation.

London-Montreal in 10 hrs. 54 min. Over 3,400 miles non-stop against 40-mile headwinds.

Monday, August 13: Loaded Montreal, New York 7:31 a.m. On schedule. Ready for demonstration flight in 30 min. Total of 43 airline executives, 57 press members greatly impressed by Britannia's performance, particularly

low-noise level. Demonstrations complete, prepare for next stop transcontinental trip, New York-San Diego, carrying 12,000-lb. payload.

Tuesday, August 14: Strong headwinds, severe storms, dark mid-air clouds. Britannia still makes timing trip in only 4 hrs. 36 min. Arrives San Diego with airline representatives aboard delighted by smooth, comfortable ride.

Sunday, August 19: Windy day, successful West Coast tour. Remarkable reception at San Diego. Bakers, Los Angeles airports. Over 30,000 visitors walk through and inspect aircraft. Los Angeles reports 300 phone calls per hour from people eager to see "Whispering Giant."

Monday, August 20: Vancouver-San Francisco, 2 hrs. 39 min. Tuesday, San Francisco-Denver. Wednesday, Denver-Chicago. Demonstrations flights in each area. Enthusiastic reception each stop for Britannia.

Mid-Pacific flight: "Operation Clockwork" aims to cover 26,000 miles in 44 days. Total time to date, 31,24 hrs. Total distance, 8,600 miles. Engineers report perfect mechanical

conditions, engine coverings remain unscratched since London.

Thursday, August 23: Chicago-New York after historic tour of seven major U.S. Canadian cities. "Whispering Giant" receives enthusiastic reception everywhere. Log shows 37 flying hours, 11,000 miles, 823 airline executives and press representatives present to date.

Saturday, August 25: New York-Miami, where Florida is vastly impressed by the Britannia... the Governor of the Bahamas requests the "Whispering Giant" to make a special fly-past.

Monday, August 27: Miami-Washington, D.C. where officials praise Britannia's extremely low noise level and remarkable reliability.

Thursday, August 30: Peter Masefield, Managing Director, Bristol Aircraft Ltd., calls London. "Two demonstration flights from New York 24th. Remarkable demonstrated on tour has created profound interest in all airlines. Now only last lap to go."

Friday, August 31: Despite adverse weather, Britannia *Baker-Jig* flies nonstop Idlewild-London in 10 hrs. 18 min.—the only successful nonstop crossing that night. The "Whispering Giant" completes historic "Operation Clockwork" 100 flying hours after rolling off the production line... 44 flight hours, 26,000 miles after take-off from a London Airport runway.

From the record—for the record books: Britannia *Baker-Jig* was the first turbine-powered jetliner ever to fly New York-London nonstop... and yet this is only the airline-range Britannia.

From the start of "Operation Clockwork," this production model Britannia flew 36,000 miles in 44 days, made 52 take-offs and landings in and out of ten cities in the U.S. and Canada, carried more than 1400 airline executives and press members on 32 demonstration flights.

Throughout, the engine coverings were opened only once. Total oil consumption was 11 gallons. *Baker-Jig* consistently best scheduled operating times by up to 20 percent. Although average takeoffs were 11 m.p.h., she achieved an average true air speed of 346 m.p.h... while average hourly fuel consumption was 590 gallons.

From take-off to shutdown, the "Whispering Giant" showed her remarkable pace in when gently enters the record books as Bristol's historic "Operation Clockwork."

BRISTOL
Britannia
BRISTOL AIRCRAFT LIMITED, ENGLAND



FOUR-STAGE hypersonic test vehicle seen off launching pad at NACA's Wallops Island Flight Aircraft Research Station.

NACA's Mach 10 Rockets Aid ICBM

By David A. Anderson

Langley Field, Va.—Design data for intercontinental ballistic missiles is one objective of hypersonic flight tests being made with multi-stage rocket-powered vehicles by the National Advisory Committee for Aeronautics.

Current concentrations of the design program is on heat transfer during reentry. Later program expansion will aim at dynamic stability, pressure distribution and other basic aerodynamic data.

Most of the test vehicles launched at the Pierson Aircraft Research Station at Wallops Island off the Virginia coast are three- or four-stage subsonic-adjacent rockets with hypersonic payloads. One of these test models, a four-stage unit using two Nike booster rockets and two smaller Thor-like rockets, reached a speed of Mach 18.4

at 54,000 ft almost two years ago. From this family of test vehicles NACA expects to derive data that will enlighten some of the nonstandard complex problems which will continue to plague ICBM designers.

Various Vehicles

Latest four-stage rocket vehicle to be used by NACA's Pierson Aircraft Research Station is started on its hypersonic flight by an Honest John motor. Second stage is a standard Nike booster, third stage is a Thor-like motor.

The test vehicle itself contains the fourth stage motor, a Thor-like T-55 unit, as well as the necessary motor instrumentation to measure the data and transmit it back to a ground station by radio.

Size of the test vehicle is about six feet long with a six-inch body diameter. Its nose is equal with a blunted

tip that will be a design characteristic of long range ballistic missiles. Another proposed ICBM feature, a fixed tail, is used for stability, instead of fins on the fourth stage. (A prototype ICBM the fixed tail could have another advantage: provision of room for the action of guided missiles.)

Test Model

An unusual materials test model, with a body shaped with multiple profiles, has been developed by NACA to check the tendency of metals to spall rather than melt at the high stagnation temperatures of hypersonic flight.

This model has a number of probes jutting out from the cylindrical body section. Each probe carries a thermometer of a different material, being forward to record local stagnation temperature and stored off the surface

of the model so that the thermometer will be completely outside the boundary layer. Thermocouples in the air have sensors, heat transferred through the shock layer at the stagnation point at the front of the hemisphere.

A two-headed instrument provides NACA standard tests: very sharp, heat transfer at an angle of attack on bodies and wing surfaces. A pair of rockets is mounted on the nose of a Nike booster, with both models at the same angle of attack, but one at a positive and one at a negative value of that angle to the third line. The two, inclined displacement of the angled models shows that the left leads will balance and the whole vehicle will fly straight, both models will maintain a known angle of attack. The two pronged vehicle will be boosted with a Honest John motor, and the engine location is expected to get to Mach 3.

Flight Paths

Two trajectories are commonly used by NACA to study the heating problems in hypersonic flight.

• "Straight away" in which all four stages are fired consecutively on the ascending leg of the flight path. This is the technique to be used in ballistic missiles to achieve maximum range.

• "Over the top" in which two stages are fired on the ascending leg, followed by a coasting period during which the vehicle passes through the zenith of the trajectory and starts to fall back to earth.

The remainder of the stages are then fired to achieve maximum speed in the flattest arc, thus simulating the reentry problem.

The success of any program using either of these trajectories hangs on precise calculation of the flight path, with exact stipulations of the firing times for each stage. It is a general practice to use a coasting or delay period between stage firing, and the length of these delays determines the trajectory just as much as the powered portion of flight do. Consequently a tremendous amount of trajectory analysis has been done to establish a series of optimum flight paths which vary with the vehicle class and the data desired.

Propulsion Details

The high reliability of the solid propellant rocket is the major reason that NACA has stored with this type of propellant all through its pioneer aircraft research program. Availability of the rocket motor has been an important factor also in sticking to the solid type. Without satisfactory development funds, NACA must choose its propellant from the available stock of military rockets, hence the use of Honest John, Nike and Thor-like rockets. Only the first stage of the trajectory

vehicle is not physically fixed to the rest of the vehicle. It is separated by a subsonic drag chamber. The after stages are locked together.

For the second-stage stage connection, a lock pin is used that is fired out at the appropriate time. The third-stage stage connection is a threaded plug, mounted on structure extending along ahead of the first stage rocket nose. This plugpin is secured into the neck of the fourth-stage motor and when the plugpin is fired, separating the stages rapidly and sending the fourth stage into free from the extremely low ambient pressure at the time of its firing. Lack of such sealing has caused other test models to blow up after attempts at high-speed starts in the extremely thin air.

Detonation developed by Hercules Powder are used to guide the solid propellant charges during a typical straight reentry trajectory. These grains have been used for time delays up to 40 sec.

But for the over-the-top flight path, where delays of up to 90 seconds are common, boost-time timers are used.

Record Breaker

The test vehicle that soared through Mach 10 two years ago had a record to a point, altitude of about one million feet. It was made with all-threshold components: two Nike boosters, each 11 ft long, served as first and second stages. Third stage was a Thor-like T-40 rocket, 45 ft long, fourth stage instrument motor was also a Thor-like unit, a T-55, and the overall length of the fourth stage was six feet.

The four-stage vehicle totaled 15 ft 8 in long, including the alignment and connection between stages. It weighed 2,100 lb.

The first stage accelerated the vehicle to Mach 4.2 at 1,000 ft; this was followed by a coasting period of about 11 seconds, and the second stage was fired.

The vehicle reached Mach 4.2 at 22,000 ft, and again coasted for five seconds before third-stage ignition.

That powered portion of the trajectory took the vehicle to Mach 5.5 at 40,000 ft, after a short coast period, about two seconds—the fourth stage ignited and the model was traveling at Mach 10.4 at an altitude of 54,000 ft when fuel burned out.

Range Changer

These recent hypersonic test vehicles have forced an expansion of NACA's firing range at Wallops Island. New reentry trajectory has made the task, a group working out of Norfolk, helps in clearing and protecting the area. As these probes are fired time to time to test reentry.

Most of the firings are scheduled for

Florida between October 10 and 15. In those 10 days, tests are ready to go back to Norfolk for the weekend, clearing the ocean, and of solid vehicles and testing program reports on shipping back to Langley.

Search aircraft extend their horizon and help NACA in the lower test firing these problems, over the last shaped finger arms reaching out from the pilotless aircraft research station.

Range instrumentation is broadly the same as used with the electric range test: radar, telemetering, Doppler and SCR-554 radar for tracking. Markers are Doppler tracked on their ascending leg and that data, coupled with the telemetering information from the inside the delivery overall performance of the vehicle.

For long-range flights Doppler is also used in the ascent but skin tracking with the SCR-581 set has given a successful technique out to about 70 mi. dual stage. This is in contrast to the repeated tracking ranges of several hundred miles anticipated with the arrival of C.W. nosecone radar in the Air Force's Mark 40 Cluster, Fairchild AF-100. NACA hopes to acquire



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management is solution to GC projects a serious problem, one which Creative Aircraft Engineering Corp. solved using a lightweight mechanical system. Gura was also conducting research into

In its 30/30TF supersonic fighters, Germany had a number of events which the demand since that time 1-2 years in each field as the war table. Keeping the CG within range at high fuel loads and during serial refueling was solved by incorporating a system which uses regular loads as the main power, and a spring loaded valve which senses deflection in bend between the two tails and has fuel automatically pumped or regulated to maintain the desired CG limits. The system includes a "memory" so that balance errors will be corrected rather than added.

Before the system was incorporated into the airplane, a mockup was constructed and the system given a thorough checkout on the ground in various attitudes and loadings. The bags were again removed from the system using the mockup, tests of which were conducted at the facilities of the principal vendor, Parker Aircraft Co.



Compact Manifold

This compact, manfolded mounting base for the hydraulic guidance system portion of the Coarse Tractor eliminates all external plumbing lines on the machine. The package itself contains 15 components, all of which mount on this manifold and are then interconnected through 15 feet of integral plumbing. Components can be readily removed for servicing and the entire hydraulic assembly has enough in it to

system which also has been used to obtain test data on head CG positions during flight tests.

Honeycomb Panels

In a new approach, the possibilities of based aliphatic isocyanate-polyols and the high-temperature bearing polymers in general, in gas turbine applications, were revealed by Solar Aircraft Co. engineers John V. Long, George D. Garner, and Richard S. Mueller.

This new aircraft is based all-around Boeing's 737 and is its original extension of its already-established and successful aircraft structure.

These applications are available with the **Thermal cup** ring. This experimental application is achieved in a possible manner in perfect operation of the gas turbine rotor with zero tip clearance of the blades, in boost efficiency. The still thing ring ring consists of an open race sandwich made up by heat bonding the metal core to a backing device.

In the example cited by Solar cup recent, the OPA (in page 1) was inspired over the low-pressure core made was removed as a result of direct contact with the turbine rotor in service. While blade interference was as high as $\frac{1}{16}$ in., no pitting or surface of the turbine



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Kobe Aircraft Corp. is anticipating future aircraft operating needs by preparing for the development of heated transition windshield structures and other windshield redesign to permit operation above 13,500 ft and 2,000 ft. Also, methods for fabricating large windshield parts such as wings and fuselage sections must be found, according to Kobe Engineer H. M. Rank.

No identification of Ruby aluminum windshield structures according to aircraft has been made, but reports say that parts have been made for Carver's response #55.

Problems still remain which challenge the fabricator. These include forming detail parts to close tolerances, holding inside this gap; care for machining, machining finish; care for clear tolerances, critical clearances; forming, complex fabrication of bearing features and joint design, flush and.

Supersonic Propellers

Supersonic propellers, combined with aspects of turbine engines, indicate definite promise in propeller efficiency for high subsonic airplanes, according to a paper delivered by Daniel H. Jacobson, chief of aerodynamics, and Robert A. Ragen, aerodynamics supervisor of propellers operations, Allison Division General Motors Corp.

Emphasizing the obtainability of long ranges and high speed with propellers, the paper noted that certain aerodynamic configurations, different from conventional subsonic propellers, combined with changes in design criteria, could effect high subsonic aircraft speeds using supersonic propellers.

The paper touched on the structural problems of a proposed supersonic design which used a small diameter, short chord, low thickness ratio and flat pitch, noting that increased loads and conventional flutter problems may have to be changed while the all important operating stresses will be the most steady stress, calling for increased strength in hubs. Blade changes, resin resin and other components, is this size.

Some test data has been obtained with the Republic XF-101 and McDonnell XF-108 airplanes, the paper stated, which have not been used and theoretical investigations. In general, the paper says, test results have indicated predicted performance to be slightly conservative.

Electrical Equipment

Highlights of the challenges facing designers of electrical equipment for future supersonic aircraft were outlined by Victor B. Ebert, Boeing Airplane Co. Moving into the supersonic flight regime elevates the relative degree of importance of electrical systems and

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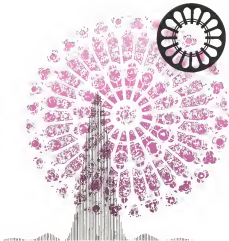


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components to the point where this may well become the limiting factor in the speed of the vehicle, he said.

Temperature is advanced as the most significant concernment to affect materials and equipment in a supersonic vehicle.

Analysis of the limitations of presently available materials and projected improvements indicate that the equipment designer and manufacturer must, in some cases, discover new materials to develop new techniques for applying known materials, if the operation of supersonic vehicles is not to be compromised.

Electrical Repetitivity

Increases in electrical resistivity of metals is one pronounced effect of temperature. Thus at 500°F, resistance of copper is 2.8 times that of room temperature resistance, while nickel is almost 6.4 times over the same temperature range.

Temperature also will have a significant effect on magnetic properties. At 1,000°F, saturation flux density of iron could allow permeability of the very high temperature magnetic materials being developed has decreased to 17 kilogauss, appreciably lower than room temperature level of about 22 kilogauss.

At 1,000°F, where steel (used in wiring equipment, transformers) is more severely affected. Oil-filled (which now alloy developed for magnetic amplifiers) is completely useless at that temperature, that said. While ultimate temperature limit of magnetic materials in general is about 3,500°F, special applications may limit their use to a much lower temperature.

In future vehicles, noise levels will be sufficiently high that equipment may be limited directly by requirement of acoustic energy. Estimates are that sound level pressures for vehicles of the future will exceed 174 db.

Noise Effect

Little is known about the effect of noise on equipment, that pointed out in the laboratory, military type cushion tubes have failed after only a few minutes of exposure to 150 db. A sound level of 150 db has been known to cause structural failure in existing aircraft.

These design factors of high performance aircraft point to the need for a higher action voltage, that said. One of these is the increased electrical load, another is high altitude operation, while the third is increased ambient temperature corresponding to higher speeds. At 7100 ft it will take 24 times as much copper wire to conduct the same current as required at room temperature. That can reduce a substantial weight penalty in a supersonic vehicle. Likewise



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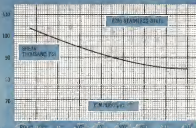
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method of reducing this weight that claims, it is to increase the static safety.

As operating voltage is increased, Cowan and ARCCover will require closer attention.

Sound Reduction

Airplane performance has grown by leaps and bounds while sound reduction efforts have been at a minimum over the years, resulting today in a situation wherein sound exposure has to be taken as a by-product of an order to stand still before the learning of the passenger noise level tolerable, let alone reducing it to a more comfortable level.

But, according to R. A. Rose, department manager of physics research, Lockheed Aircraft Corp., has resulted in his company setting up a joint sound investigation area which has designed several pieces of equipment for its own research lab.

Equipment which Lockheed built to investigate sound problems include an anechoic chamber, a transmission chamber, a propagation constant chamber, an air duct noise investigation facility, a transmission test facility and a background anechoic chamber.

Each of these tools is being used to break down sound propagation points in the airplane and at the same time, investigate ways and means of reducing sound in transmission during installation, structural design or various other means.

A definite ground operation plan may be the difference between a logical, reliable and reliable version system, and one that is a mess of ducts and cutouts. William E. Rose, Lockheed Aircraft's senior test operations coordinator told the meeting.

Nonpower

It is a reliable quantities of nonpower and their skills will determine to a large degree the design philosophy for the weapon and ground support equipment and details the extent and type of maintenance performed at the current level.

It must be remembered, Rose indicated, that there are many reasons why a new version of a system is not really skilled in the service.

Until this trend is reversed, an air design should be a system that cannot be changed in process available type of aircraft to be used.

To compensate for lack of skills and parts, manufacturers' ground support equipment should be so well designed as to be able to be removed at an air base or major sub-component. Rose said. Where possible, equipment should be capable of trouble shooting with standard test equipment.

Thompson Building Development Center

Cleveland—Thompson Products, Inc., Cleveland, Ohio, is starting construction immediately on a \$10 million crop rearing and development center on a 100-acre tract near Kinsley, Va. Scheduled for completion in 1961 the facility for Thompson's Aerosol Division will be used for testing fuel systems and various power systems for rockets and missiles. This division of the company is now engaged in both development and production.

Financial outlook in Thompson, the center which completed will consist of 14 buildings, including one will stand on a half-acre lot which is used for individual solution for various test work.

It will be adequately supplied with water and electric power.

One of the prime considerations in selecting the site was its proximity to a number of technical schools from which Thompson hopes to recruit graduates and obtain part time and consulting service from their teaching staffs.

Initial operations is scheduled to get under way in 1957 with a staff of probably less than 100. The staff will be gradually increased to an estimated 500 when the facility has been completed. The testing to be done at this new center will support the activities of the Aerosol Division at the company's Tapes plant in Cleveland.

"It will be an independent research and development center where the Aerosol Division will carry out programs now in progress and planned in development of systems to be used in the aircraft and aircraft of tomorrow," P. T. Angell, Aerosol Division manager, said.

New ARDC Unit to Design Flight Control Displays

Wright-Patterson AFB, Ohio—A new branch to conduct research development, evaluation and integration of flight control system displays in all USAF aircraft has been established at the Flight Control Displays, Wright Air Development Center.

Known as the Design Engineering Branch, the facility will carry out plans for the Control Display Integration Working Group. The group composed of representatives of several headquarters and other WADC components concerned with aircraft instruments, does research in the presentation of information in various and types of aircraft.

Head of the new Branch is C. J. Sander, Section and three chiefs are Display Engineering, Light Systems Integration, and R. S. Trenchard, Specifications and Standards, John Hart.



Republic P-47F Thunderbolt with some of the armament and fuel tanks it carries in addition to the A-bombs.

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The Thunderbolt's capacity of more than 6,000 pounds of bombs makes it the nation's most powerful fighter-bomber. Holder of the U.S. transcontinental speed record, the P-47F is also capable of global maneuvers by refueling in flight. This technique enabled it to set the world's non-stop jet fighter long distance record of 1,135 miles from England to Texas. The P-47F is also highly effective for interception and escort missions.

The exceptional performance of the Thunderbolt was designed and built into it by men of vision and experience. They employ the best manufacturing equipment and materials such as Cherry rivets, setting guns and accessories used in building many components. The

use of Cherry rivets in aircraft construction makes possible refinements of design and contributes to modern streamlining—helps achieve maximum flight performance. They also increase production, reduce unit costs.

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FACILITIES OF NATO's new Training Center for Experimental Aerodynamics include open-jet wind tunnel capable of speeds to Mach 2.5; composite low speed wind tunnel.

NATO Opens Aerodynamic Center

Rhode St. Genois, Belgium—Twenty students from 12 North Atlantic Treaty Organization countries will begin classes this fall at the new Training Center for Experimental Aerodynamics—a joint Belgian-U.S. project to give European nations the latest knowledge and experience with the most advanced aerodynamic test techniques.

The research facilities have 10 miles south of Brussels, was built in the early postwar years to support an aircraft industry that failed to grow to meet expectations.

Alleviate Shortage

The facilities were on the verge of falling into disuse when the NATO Advisory Group for Aeronautical Research and Development (AGARD) decided last spring to try to alleviate the shortage of European scientists and technicians who had experience in the latest procedures for aircraft and missile research and development.

AGARD surveyed existing facilities in Europe, decided on the Rhode St. Genois venue, and the Belgian government offered it for use. The agreement was signed Oct. 4 by the Belgian Minister of Communications and Lt. Gen. T. R. Larkin, director of the United Weapons Development Program and European representative for the office of Dr. Clifford C. Farnum, Assistant Secretary of Defense for Research and Development.

The hope is that by the end of this year, all 15 NATO countries will be

helping support the center financially. Belgium's largest investment is in the existing facilities. Most of the U.S. funds involved will go towards modernization and up-to-date instrumentation of the aerodynamics research facilities, but the U.S. also is providing technological support and direction of operation.

Dr. R. F. Harrington has taken two years' leave from Reynolds Polytechnic Institute's Aeronautical Engineering Department to serve as the center's technical director. His top assistant will be Dr. Robert H. Kunkins, who as-

sisted his Ph.D. in aeronautical engineering from the California Institute of Technology in 1954.

Classes will be divided into quarters, with the student body gradually building up from the original 20 and the rotating schedule shift increasing from the original half dozen to six members.

Scholarships will be provided for students whose countries cannot afford to send them. Students will be drawn from colleges and universities, industry and the military services. The courses will be for two years—a year of study and a year of applied research.

Student Selection

Although the program is intended primarily for young post graduate students and engineers, criteria for selection is left up to each NATO country's government. It is possible that students with years of experience in the aeronautical industries will come here for study.

Facilities of the center now include:

- A 16-in. dia., open-jet, tunnel capable of speeds to Mach 2.5
- Composite low-speed wind tunnel including a 10-ft diameter open jet, a 10-ft diameter vertical closed jet and a 6-in. closed jet
- A 6-in. diameter open jet low turbulence tunnel of the diffuser type
- Metal and woodworking shops adequate for fabricating wind tunnel parts and research models
- Optical and photographic laboratories
- Drawing office, administrative offices and restaurants

Modernization Plans

Modernization with U.S. funds will include building of new modules at the center.

AGARD's decision to establish a cen-



Army Sled Reaches 1,300 mph.

Army sled—designed and built by Aerojet Ordnance Inc., Redlands, Md.—reached velocity of 1,300 mph in less than 2.5 sec. The sled weighs 7,000 lb., and is propelled by three solid propellant rocket motors. The testing runs for environmental testing of components, were made at the Naval Ordnance Test Station at China Lake, Calif. The company plans to try for runs at higher speeds.

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will, played with handling
trucks and in reach of 4,000 rpm
times at engine power. Roll back
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find to develop new manufacturing
standards and inspection methods to
keep their engine quality under control.

A new engine problem was a 185
rpm, combustion instability, which would
oscillate back and forth between an
engine and engine engine engine
and reduced flow in the fuel feed lines
until the combustion built up into a
violent "chugging," which would no
longer require the use. Here again
the solution was engine engine design.

Bristol Builds Engine Shop at Mexico City

Mexico City—Bristol Aeroplane Co.
of Canada Ltd., Montreal is building
a \$500,000 shop at the Mexico
City International Airport to overhaul,
maintain and repair aircraft engines up
to 3,500 hp. A new company, Bristol de
Mexico, S. A. de C. V., has been
established as Bristol's first engine over-
haul affiliate in Latin America.

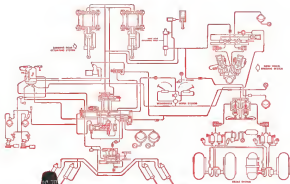
Previously, Aeromex de Mexico,
a Mexican airline, maintained a repair
shop in Toluca for engines up to 2,500
hp. All more powerful engines had to
be sent to the United States for repair.
Aeromex will have about a 25% re-
pair volume at Bristol de Mexico.

Initial operations will get underway
at Bristol's Mexico City plant in March.
The new shop, 3000 sq. ft., will be
a large, modern, well equipped
shop. It will handle two test cells,
and will handle about 30 engines per
month on an average basis. The
test cells are being furnished by Jenbacher
& Co. Inc., Hightstown, New Jersey.

Steel, Titanium Press Goes Into Operation

The new steel and titanium extru-
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corrosion, acid, alkalis, chemicals, grease,
heat, cold, moisture, oxidation.

The Answer to Jet Age Accessory Power Problems

The need for hydraulic, electric, and mechanical power increases with every stage advance in aircraft performance. The high air speeds of today's jets demand more hydraulic power for aerodynamic surface and braking controls. Wide-open use of electronic equipment has greatly increased electrical requirements. The increasing altitude limit of high performance planes calls for complex bleed air systems that only today's designer plus an accessory system that can meet increased power requirements in such low space, but it must be able to run smoothly in hot air conditions.

Some accessory equipment uses air as its energy source. In fact, bleed air drives started in the engine hydraulic control system, and gas turbine power units (GTU's) are extremely valuable to high altitude operations. In addition, they generate air much less in quantity than a method of removing the heat must be employed. Other limitations—such as inadequate bleed air, fuel pumps, or the absence of extremely high temperature fuels—may provide the use of these methods of thermodynamic responsiveness continue to grow.

Heat Problem Causes The Design Fix

The heat problem has become a serious design fix because of the importance of safeguarding the accessory system as part of the basic propulsion and surface design effort. In the absence of adequate bleed air, sufficient high temperature design may be the only way of avoiding cooling thermal conditioning equipment and methods as part of the bleed air system in order to cool surface areas as well as internal mechanisms.

As a reliable, convenient source of compressed air, the jet engine provides the way to solve some of these problems. As evidenced from its widespread use, the bleed air is much more part of the aircraft surface for propulsion control, boundary layer control, and deicing than the bleed air of this equipment is changeable to the air itself. It is becoming practical to use the constant energy source—compressed air—for operation of the plane's entire accessory system.

Air-Turbine Drives Permit Integrated System

This trend soon has importance on its

role and selection of accessory systems. With a compressed air supply already in place with the aircraft, the use of air turbine drives permits more efficient integration of the aircraft and the accessory system. In many installations, the same air used in the cooling surface system can be used to give bleed turbine which is mounted on shafts. These air turbine drive generators, hydraulic pumps, fuel pumps, thermal conditioning equipment, pneumatic actuators, and other accessories.



Turbine Run on Air Bleeded from Compressor

The operating features of such new air turbines, such as those on Boeing's B-52, show that the simple, compact, lightweight design construction of air turbine drives can greatly minimize weight and result in longer more dependable service life. Additionally, this point also reflects the parallelism of generating air, required with a ground source of air, can be limited without limiting the main engine.

Install Where Power Is Needed



Air-Turbine Drive Mounted Locally

As engine drives and the accessories they operate may be located anywhere in the plane where power is needed, in the B-52, for example, ten hydraulic main pumps are distributed in both wings and the fuselage—close to the point where power is needed. Such versatile functional location is possible because air is relatively easy to transport and because it requires no return system.

Located close from the engine, these drives can contribute to a cleaner airframe design by cutting engine bleed air use and reducing bleed air loss. Also, by locating them close to the "service area," close hydraulic and electric transmission lines from the engine and bleed air are not a source of cooling and heating devices change the main output to meet the power requirements.

Reliability of an air turbine drive system is achieved by cross-transferring the power to any single drive. Through the method, all work on the aircraft can operate from one or two installations of engines. In such engine redundancy failure of one or more engines would not mean loss of accessory power to any one engine connected to supply bleed air.

Forecast for the Future

Small and Nuclear Powerplants—It is expected that air turbine drives will play an increasingly important role in the future, by aircraft utilizing a turbo-prop,

or jet engine, or the engine may be shut down during the emergency period of flight. This would mean that an auxiliary power source would be available from the main powerplants for accessory operation. A pneumatic system, however, would provide accessory power under such conditions.

Another indication that most accessory power will be needed in the future even in the anticipated requirements for nuclear-powered aircraft. Large amounts of power may be needed for specialized functions associated with the reactor. Reactively heated attachment devices, linked with an auxiliary power unit, could supply a large block of power without a prohibitive increase in wet weight or cost.

G-E's Powered Air-Turbine Drives

General Electric's Aircraft Accessory Turbine Department in Lynn, Mass., is one of the nation's prime suppliers of air turbine drives for aircraft accessory power.

Drawing on G-E's vast experience in producing industrial and aircraft gas turbines, this department has continuously advanced the state of turbomachinery equipment design.

Just as General Electric pioneered the "radial" aircraft turbopropellers in 1918, through the Aircraft Accessory Turbine Department, it is now building air turbine drive equipment to answer the accessory power problem of the jet age.

G-E Turbopumps and Turbine Drives help supply all hydraulic and electric power in the Boeing B-52 Stratofortress, but aircraft in history to use pneumatic-driven power equipment for operating its entire accessory system.

Driven by air bled from the jet engines, G-E turbopumps and turbine drives supply 6 gpm at 2000 psi and 50 kw at 100 rpm, respectively. They give the high bomber power for operating steering, control surfaces, landing gear, bomb bays, ejection seats, lighting and armament.

G-E Fuel Turbopump

This model mounted on drives only provides 80 gpm of vapor lock free fuel gas service, giving North America's F4D Phantom the extra fuel needed for ultra-burner operation. Characteristics of G-E air turbine drives: the Albeeberber Fuel Pump is lightweight and compact and can be flexibly located in the aircraft.

G-E Turboshafts

Another application of the versatile turbine is in the self-contained turbocharger based on the Martin B-57 which drives a jet engine to less than 10 seconds.

It is pointed by jet engines operating from the conditions of an easily combustible solid propellant cartridge. Turboshafts eliminate the need for ground power starting units, minimize engine problems, and increase jet engine availability.



G-E Turbopumps and Turbine Drives Help Power B-52's Accessory System



G-E Albeeberber Turbopump Gives North America's F4D Phantom Power Boost



G-E Turboshafts Give Martin B-57 Quick Start. G-E Also Makes Fuel Pumps



Advanced Air-Turbine Drives Are "In the Works"

General Electric's Aircraft Accessory Turbine Department, with facilities valued at more than \$15 million, is carrying out an extensive development program on all advanced air turbine equipment. Units with extremely high power to weight ratios are already in advanced stages of testing. These programs present powerful answers to accessory power requirements that lie ahead.

To find out how G-E air turbine equipment can help you now in the planning stages, contact your General Electric Aviation & Defense Industries Sales Office or write for the descriptive brochure on the drives you are interested in.

General Electric Co., Boston 02116, Schenectady 5, N. Y.	
Please send me the following brochures on G-E Air-Turbine Drives:	
<input type="checkbox"/> G-E A-1000 Air-Turbine Drives For Jet Aircraft	
<input type="checkbox"/> G-E A-1000 Hydraulic Turbopumps For Jet Aircraft	
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a five diameter steel tube 50 ft. long to 5 sec. It was also subjected to 400 lb. of 4 in. spring steel rod in 1 sec. The machine can handle numerous small components made of titanium, stainless steel and other metals.

The 15 ft. length of the machine makes it as long as an exhaust pipe in the U. S. The machine was designed, built and installed by Evers Industries division of Bell-Houston-Hamilton Corp.

The equipment is 10,000 lbs. and 75,000 lbs. forging press which have been producing the four new wing spars for the Air Force's experimental F-407A, have saved 513 million on current orders alone over conventional building ways. The new steel and titanium parts expected to give considerable savings.

DC-8 Test Facilities Advanced at Douglas

Santa Monica—Construction of engineering test facilities for the DC-8 jet transport program is being well along at Douglas Aircraft Co., Inc., here.

Facilities include an aircraft labor room which will house a maintenance room where materials will be tested for fatigue resistance to high turbulence stress. An engine chamber will check sound radiation characteristics of engine parts, turbines and other engine components.

A control system laboratory will be used for experimentation with full-scale working models of the DC-8's control system controls.

Other installations will include a pneumatic system laboratory, a static test facility, and an addition to the electrical system laboratory.

Construction also has begun on structures for testing guided missiles in 60 ft. long tunnels and a 100-ft. tunnel for ground and calibration testing.

Bacteria Corrosion Jams Canberra Pump

London—Modern form of corrosion that caused fuel pumps of Royal Air Force Canberra jet bombers operating in Malaya earlier this year, among them to be grounded, has been traced to micro-organic bacteria. These turned sea water into sulphur, which reacted later with silver in the fuel pump action.

The General Research Laboratories, Teddington which traced the cause of this disease, announced it was using successfully the same type of bacteria to manufacture valuable sulphur from London sewer sludge. These experiments are expected to lead to sulphur production on an industrial scale.

While at Teddington research here

was looking on plans to utilize bacteria found in ponds and lakes the leader of the team, Kenneth Bostin, was contacted by Rolls-Royce about the experiment mentioned that was growing the fuel pump of jet planes in Malaya.

It was found that bacteria had on level had storage tanks from water which was used in tanks to wash out undersea delivery pipes. Covered by oil and an oxygenous substance it was then found that bacteria were turning sea salts into sulphurated hydrogen. This gas in time dissolved in the semi-liquid fuel as it bubbled upwards. Later it reacted with silver parts of the armature fuel pump and corroded them to a point where they were useless.

According to the Department of Scientific and Industrial Research, the same kind conditions for bacteria of this sort exist in London sewer sludge.

WHAT'S NEW

Publications Received

• **The Legal Status of Aircraft**—by J. P. Hing—Pub by Maritime National N.V., 9 Lange Voorhout, The Hague, Netherlands, approx. \$5.25, 214pp.

Of interest to those who are working on the development of aviation-related law, this book, which is the product of research, contains, and deals comprehensively with questions of both public and private law.

• **The Following**—five paper were presented at the SAE National Aeronautics Meeting in New York, in April, 1956. They may be obtained from the Society of Automotive Engineers, Inc., 29 West 57th St., New York 19, N.Y.

Development of a Cabin Pressure Control System for Transport Type Aircraft—by Everett H. Schneider
Integrated Flight Systems—by Ben F. McLeod

Pneumatic vs. Mechanical Power Extension for Aircraft Accessories—by Richard L. McInnis

Improvement of Jet Engine Noise During Ground Running—by J. M. Tyler and B. Kneibell

The Development of Rolls-Royce Propeller Turbine Engines—by D. P. Hadden

• **The Aeroplane**, December, 1956—Compiled by the Staff of "The Aeroplane"—Pub by Temple Press Ltd., Bowling Green Lane, London E.C.1, England. 21/4, 386pp.

The Directory provides a complete guide to all branches of Australia throughout the British Commonwealth. • **Airline Transport Pilot Rating**—by Charles A. Zeng and Allen C. Zeng—Pub by, and available from, The



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ensuring quality and grip despite vacuum, heat, pressure, and the action of acids, lubricants and synthetic fluids. Here, at long last, is a specially designed clamp with vibration resistance and positive electrical bonding qualities. It is the all-purpose clamp for all heat and rising temperatures in jet engines and other high-temperature applications.

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in the development schedule
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ment and escape of two American pilots who are forced down into the Russian Zone of Germany. One decides to remain East Germany to see out the planet's situation while he lives, follows a bar running chase as they try to elude enemy pursuit.

• **Electrical Interference**—by A. P. Hite—Pub. by Psychological Library, Inc., 35 East 49th St., New York 16, N. Y. \$4.75, 122pp.

The author discusses much of what is known about the causes, effects, and avoidance of interference with radio and television reception. Particularly valuable is a series of photographs of a television screen showing the effects on the picture of different types of interference.

• **Principles of Guided Missile Design**—Advances, Progress, Structures—by F. A. Benson, M. J. Zucrow, and C. W. Brainerd—Pub. by D. Van Nostrand Co. Inc., 325 Alexander St., Princeton, N. J. \$10.00, 356pp.

This second volume in the series covers the design fundamentals of aircraft, supersonic aerodynamics, means of propulsion, and structural design. Extensive bibliographies are included to supplement the complete but condensed coverage of each subject.

• **Proceedings of the 1956 Electronic Components Symposium**—Pub. by Engineering Publishers, GPO Box 1151, New York 1, N. Y. Paper bound \$5.00, Cloth bound \$4.25, 449pp.

Four-thirty different papers, and 291 illustrations cover a wide variety of subjects such as materials, physical, electronic tubes, solid state devices, printed circuit components, and include treatment of reliability, theory and applications, in instrumentation and measurements.

• **Significance of ASTM Tests for Petroleum Products**—Prepared and published by, and available from, American Society for Testing Materials, Headquarters, 1916 Race St., Philadelphia 3, Pa. \$2.50, 315pp.

Relatively free of technical terms, the third edition presents various test methods, performance characteristics of specific products, and the significance of the properties of petroleum products in relation to one another.

• **Aircraft Materials and Processes**—by George F. Timmerman—Pub. by Pitman Publishing Corp., 2 West 49th St., New York 36, N. Y. \$6.00, 334pp.

In the fifth edition emphasis has been placed on the effects of heat from aerodynamic heating and jet engine heating on aircraft materials in order to help the engineer select the most efficient materials. Latest processes, materials, specifications are included.

AVIATION WEEK, October 22, 1956

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THE MOBILE power unit along with two TWA-DC-4 type commercial jet will provide it with all power needs for ground operation. The unit supplies hydraulic power to tail the plane under the pilot's control. It also furnishes electrical and pneumatic power.

Pilot-Steered Wheel Units Move Planes

By George Christina

A new concept as how to propel commercial jet aircraft while on the ground without using its engines—by attaching hydraulically-driven wheel units controlled by the pilot—was recently proposed to the Ground Equipment and Maintenance Committee of the Air Transport Assn. of America meeting at Miami.

The notion, which can be handled by one man and runs readily well, given components now prepared by Consolidated Diesel Electric Corporation and Messerschmitt-Bölkow-Schubert of the Air Transport Assn. of America meeting at Miami.

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Consolidated Diesel Electric Corporation (AW Dec 27, 1954, p. 191).

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moving into the prototype production stage, it has been hydraulically-actuated wheel power units attached to one wheel of each main landing gear drive the jet while on the ground. Hydraulic power would come from a low drag (maximum weight 55 lb., to maintain portability of vehicle with aircraft) auxiliary, mobile power unit which contains an industrial gasoline motor to drive the hydraulic pump supplying power to the motor driving the units.

The mobile power unit would also be engaged to supply all of the jet's other power requirements—a dc and ac electric power, low pressure air for such jobs as engine starting, nitrogen for inert protection. A gas turbine for high volume, low pressure air to run the plane's air conditioning system or other low pressure air needs can easily be supplied as can almost any other ground service requirement.

The size of mobile hydraulic power to supply motive power to aircraft is not new. Sikorski uses it to position its large, two-engine HUS Marine helicopter (AW Feb. 8, 1954, p. 11). Sikorski's version consists of two small hydraulic motors which can be quickly attached to the rotor's main wheels to facilitate landing in crowded or no-deck. Power is supplied by an auxiliary power unit.

Consolidated Diesel Electric power unit will either be stowed under the jet's baggage or driven "in formation" with the plane as it taxis.

Less Noise, Start & Fuel

The wheel power units, with mobile power would provide airline users with a solution to several existing problems at little cost in weight, increase of air

frame weight or complexity, or increase in ground handling equipment.

For noise and blast problems, especially around terminal and passenger loading areas, would be eliminated. It would the appreciable amount of fuel a fast engine jet can swallow during long taxi runs around large airports such as New York's Idlewild.

The mobile power unit would meet the plane at the end of the arrival runway where it would be "plugged in" to the jet. The power unit would then take over and propel it to, and if necessary, from the passenger loading area.

Since the mobile power unit can substitute for support equipment and a big jet can be written off in the same manner as those ground units, Con Diesel would not estimate a price for the combination, but made an oblique comment to its being "competitive with \$10,000 ground handling vehicles."

Another concern, arising from one of the combination is that its entire operation may be performed by one man. The unit may be design to meet a "steering jet."

The WPU's are light enough—about 100 lb. each—to be ported in and out of the jet's baggage by one man without assistance. He can also cut out the pilot's controls and either propel the vehicle from the plane by self-contained winches or drive it in formation with the plane as it taxis to the terminal.

The pilot can taxi his plane to the passenger area at speeds up to 5 mph, then switch it into position through the power supplied by the mobile power unit to the wheel units. He can park the plane by locking one wheel

and advancing the other or back the step by reversing both motion.

When unattached to the plane, the mobile power unit can be driven around the airport at speeds up to 30 mph.

Airline Interest

Conrad (Boschert), Con Diesel's Technical Sales Manager, told Airline News that several airlines, which have ordered Douglas DC-4s or Boeing 707s have expressed interest in his company's combination. Some have agreed to lead power engine equipment to test the unit when it becomes such as about eight to twelve weeks, he added.

Airline manufacturers are also interested, although one did express the opinion that the plane would still be moved around the airport as usual.

How it can Con Diesel describe the combination. The mobile power unit will have conventional steering gear.

The power motor will be an industrial type gasoline engine with a simple transmission in gear case, driving a hydraulic pump to power the wheel units. It also will power a 50 kw, 400-c. alternator. Space will be provided for a 1,800 amp d.c. generator, while spare is provided on the vehicle's rear deck for a gas turbine compressor.

The wheel units which are hung on the rear of the vehicle, have a handle on top and wheels underneath to allow the operator to detach them, push them to the jet transport's wheels and attach them easily.

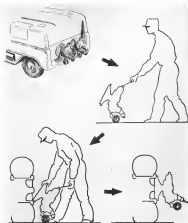
The WPU's will be powered by two hydraulic motors. They will be so made that attachment to the plane, which can be accomplished in 30 seconds. These design will require little modification to the wheel to make attachment possible.

Con Diesel engineers would not say what type of technique will be used to take up reaction torque on the wheels. The company said it is studying several approaches.

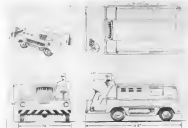
Pressure units will keep the flexible hydraulic lines between vehicle and WPU's taut to prevent them from dragging along the ramp.

Pilot Controls

Con Diesel contends that it has not decided just what controls will be provided to the pilot to taxi his plane. The company fears hydraulic controls because they would be complex and more straightforward. Although the WPU's would probably be driven by a 3,000 psi hydraulic system, the cockpit controls would be a more direct system operating at a much lower pressure. Research suggested that the pilot might lose the controls as the car-pole and lever the hydraulic line to the ground operator when stopping at the end of



DRAWINGS show how a wheel power unit can be removed from the mobile power unit, wheeled into place and attached to the main landing gear wheel by a single man.



THREE-VIEW sketch shows the principal dimensions of the low-friction mobile power unit.

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Lightweight Camera

This new aerial reconnaissance camera features ruggedness—it has especially withstood 40C—freezing and heating loads—and lightweight—it weighs only 20 lb. Yet it requires fewer than 1000 components, and a 2 x 9 in. film and a 8 in. mirror. Made by Ikon Corp., the unit is designed to be used in all types of aerial platforms, both manned and unmanned, where weight is critical. The camera says that the unit is one-fifth the weight of comparable aerial cameras. The camera model KA-20 was designed for use in smaller and high speed down aircraft. The first KA-20 was made specifically for installation in the Lockheed K-121. It was developed under the direction of the Signal Corps Engineering Laboratories, Fort Monmouth, N. J. Ikon's address: 2801 E. Colorado St., Provo, Utah.

the runway. These would be quickly connected to the mobile power unit, and the pilot could then proceed to the runway.

A low impedance electrical control system, regulating the hydraulic system through solenoid-operated valves, could be an alternative disarming method—but the addition of the electrical equipment would add complexity too, Con Diesel thinks.

An ideal situation would be for the vehicle manufacturers to build into their planes a cockpit control with either hydraulic or electric lines for monitoring it as a quick connect/disconnect terminal mounted at some appropriate place on the lower fuselage. Also, Con Diesel hopes that it will be possible for manufacturer to be provided as far as the fuselage where the mobile power unit can be attached and hooked to avoid having to drive it in formation with the plane as it runs.

The manufacturer hopes that these considerations will cause to gain if these concepts gain wider acceptance.

Con Diesel has been producing an emergency component including mobile power units, for the USAF and the

AVIATION PROGRESS with G-E aircraft motors

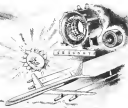


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Continental Shares in Another Aviation "First"

... CESSNA MODEL 620, WORLD'S PIONEER PRESSURIZED FOUR-ENGINE EXECUTIVE TRANSPORT

Two organizations long noted for their contributions to flying have joined hands to achieve another major aviation "first." Cessna's Model 620, now flying... The Cessna Model 620, world pioneer of its type—first pressurized four-engine airplane built for the corporate market—unites several qualities which users of executive aircraft have long desired. Its four Continental Red Seal GS552S-A engines provide four-engine safety, with the important

plus of Continental dependability, economy and service backing. It is pressurized for altitudes up to its four-engine service ceiling of 27,500 feet, and air-conditioned for comfort aloft and on the ground... Flights during three years' work on this advanced airplane have fully borne out its builders' highest expectations. The Cessna 620 now takes its place as the late at on the long roster of fine ability aircraft using dependable Continental power.

Continental Motors Corporation
AIRCRAFT ENGINE DIVISION
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Nine for more visits. The company has produced over 2,000 units in 14 different configurations.

Studies on the current mobile power unit and WPU's have been in progress for over one year, according to Rensenberg.

Scandinavian Airlines Buys DC-8 Simulator

A contract for a Douglas DC-8 electronic simulator has been received by Link Aviation, Inc. from Scandinavian Airlines System. This is the third DC-8 simulator to be sold by Link. Other purchases are Douglas Aercraft Co. and United Air Lines. Among the features incorporated in the simulator will be cockpit replicas, a visual approach and landing system and simulated weather radar. Link says that the simulator will be delivered to SAS at least a year before the first DC-8 is expected to be put into service, thus giving the airline's crews ample time to familiarize themselves with the plane's cockpit and flight characteristics before facing the actual aircraft.

OFF THE LINE

A \$199,800 contract for Pan-Blum powerplant engine parts (AW March 26 p. 75) has been awarded to The Casa Encargada Corporation of Mexico, Coahuila de Zaragoza. The contract is for the engine parts for the Pan-Blum aircraft for use on the engine parts.

A new tapering process which results in aluminum alloy head forgings with very low internal stresses has been developed by the Aluminum Company of America. Immediate advantages are appreciable reduction in machining and strengthening time which cuts production costs. The new process, designated T-5, is based on a process that has been used for many years in the production of aluminum forgings.

A new engineering, manufacturing and sales organization dealing in aviation electronics and related electronics has been formed under the name of Dyna. The company is a development of the Electronics Control division of Rockwell International Co. Purpose of Dyna is to give customers the service and technical support personnel to research, new product development, specialized circuit applications, sales engineering and field service. Address: 1500 South Dinkels Ave., Milwaukee, Wis.

A program of equipment modernization has been established by the DeVilbiss Co. under which model 225

PIONEERING is our business



SERVICING LIQUID OXYGEN MADE SAFER AND EASIER BY NEW BENDIX DUAL INDICATION

Bendix capacitance type liquid oxygen quantity gauge systems now offer dual indications—in the cockpit and at any desired point on the airplane.

Two important advantages are gained when so indication is located near the servicing point:

1. The mechanic can check the liquid oxygen supply in the system quickly and easily from the ground as part of his regular line maintenance.
2. In replenishing the liquid oxygen supply, the serviceman gets a continuous reading right at the point of servicing, so that he knows exactly when the converter is filled, rather than having to wait for the liquid

oxygen to spill out the vent valve—with the hazard that inevitably accompanies such a procedure.

Bendix systems for measuring liquid oxygen levels are completely standardized to meet critical weight and weight limitations. They work with both single- and multiple-converter installations and are adaptable for use in missiles.

For full details, write PIONEER-CENTRAL DIVISION, BENDIX AVIATION CORPORATION, DAYTON, OHIO 45424.

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Kaman's Engineering staff has already designed and developed the world's first true utility helicopter, the first drone helicopter, the nosecone and the highly successful HO4K utility helicopter. It is now hard at work researching ringneck aircraft and pioneering on other highly classified projects.

A Kaman Engineer must be technically qualified, of course, but he must also be able to exercise initiative and think on his feet. Most importantly he must have vision and be able to apply himself to the project assigned him. The reward for his intelligent hard work is a salary commensurate with ability, extremely pleasant working conditions among people with a job to do, and the satisfaction which comes from a job proudly and carefully accomplished in the interest of our National Defense.

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compression can be replaced with model 330 seats and the 235 and 502 seats may be replaced with the new, V-type model 412 compression. The change-over program can be done at microscopic cost and without excessive compressor downtime.

Gordon Enterprises, North Hollywood, Calif., has been awarded an Air Force contract for 100 electrically heated, hydraulically-controlled film drives. The stainless steel units, which will handle 1630 in. cut film, are being purchased by the USAF for the Navy under a joint procurement program.

Stallions Rubber Co., a large producer of custom molded parts, slabs and surfboards. Orange and hydraulic sealings has expanded its Cedar City, Calif. production facilities 300%. In adding a 5,000 sq. ft. two-story building.

A new plant to manufacture Ethyl anti-knock compounds will be built in the San Francisco Bay area, according to the Ethyl Corp. The facilities will be large enough to meet the growing aviation and automotive needs of the West Coast and industry.

Lockheed's helicopter division will use a new type of search disc hole with internal radial bump and angle-perfected automatic alignment screwing to the hole's misalignment, the B. F. Goodrich Aviation Products Division. The holes will feature smooth operation without chatter. Goodrich will also design and make the wheels which will mount 13 5/16, 24-gage strong tubular rim.

New service, sales and merchandising subsidiary was recently opened in Brussels, Belgium, by The Black & Decker Manufacturing Co. The Toronto, Md. firm's new unit, called Black & Decker (Belgium) S.A., will distribute the company's line of B&D portable electric tools throughout the Belgian-Luxembourg area. This is the seventh foreign subsidiary to be established by the company.

Cabin interior of Boeing International Aerostar DC-7C "El Dorado" aircraft was designed by the airline and Douglas. Most of the three cabin partitions contains the front panel of Lela America with the relaxed air formulas of the Southwest, where Boeing integrated. Aircraft is an tinted hulls, panels adorned with strips of gold or orange cloth, and plastics in oak, sycamore, walnut, champagne and gold. Floor rubber seat cushions are covered with charcoal fabric flecked with silver thread while arm rests and side panels are in coral and goldleaf.



Mobile Generator

The 28 kw., trailer-mounted generator unit is being delivered to the Marine Corps for use at color installations and for auxiliary support as a general purpose utility source. The manufacturers, Cammick, Daniel Electric Corporation, took a \$1.6 million contract for the generator unit. Shipments are under way. Address: Brandon, Conn.

latter. Plans will seat 60 passengers in 40 lower section and 75 in combination of late and coach layout.

A mutual sales representation pact has been set up between Flight Research, Inc., Rochester, N.Y. and Travel Corporation, Sherman Oaks, Calif. Both companies manufacture photographic data recording instruments including all purpose cameras used in the design and production of weapon systems and for such jobs as aerial mapping, radar evaluation, airborne systems and fire control analysis and evaluation. Flight Research will have exclusive sales rights out of the Missouri, Travel will have the same exclusive coverage in the western half of the U. S.

Crescent-Hinds Co., manufacturer of aircraft lighting and signal control tower equipment, has purchased Service Service Co., of Silver Spring, Md. Among products of the latter firm are weather observation services.

New corporation, Helicopters, Inc., has been formed by a group of men formerly with Lear, Inc., and associated with National Water Lift Co. to undertake design studies "beyond the state of the art" of such items as power control components and systems for advanced regions and airplanes. The new company's president, James Staudger, says that his firm has designed hydraulic actuators which can be used in aircraft configurations of 1,000 ft. and has developed complete aircraft servo control systems. Other officers include: Raymond Kahala and Joseph Phelan, vice presidents—engineering, and Walter Kersnow, secretary-treasurer. Address: 171 E. Kalamazoo Ave., Kalamazoo, Mich.



MERCY MISSION...

Kaman's HO4K-1 general utility helicopter, now in volume production, is designed to carry personnel, fires evacuees or cargo internally. Fitted out as a "flying crane" it can carry cargo sling externally. Equipped with a power hoist it can be used for search and rescue operations.

As a rescue vehicle the HO4K got its baptism of fire in the disastrous New England floods of August 1955, and came through admirably. Kaman is proud of these mercy missions. Kaman is also proud of the part it is privileged to play in the continuing program of National Defense.

KAMAN

THE KAMAN AIRCRAFT CORP.
BLOOMFIELD, CONN.



W. S. Navy Photo

F4D Skyray ... Navy's Sunday Punch!

The Navy's F4D Skyray — newest all-weather fleet interceptor — goes its deadly zing from its Westinghouse Aero 13 electronic control system.

Visualize good, or xero — when a Navy pilot is searching out enemy targets in a Douglas F4D, a big on his Aero 13 indicator shows him where the invading planes are. He selects the appropriate target and locks on, tracking. The Aero 13 computer calculates the proper attack course (at the pilot's option) until the target is in range. Directed by the Aero 13, the weapons are fired at the right instant — another intercept mission is accomplished!

The Aero 13 includes advanced design for convenience of installation and maintenance, by cylindrical packaging, which is adaptable for the nose of any modern high-speed fighter aircraft. It consists of hinged panels which can be swung outward and downward for quick maintenance.

Each panel section is a removable sub-assembly. Complete elements can be checked with test

equipment similar to an ordinary tube tester. Built-in test points in the radar subassemblies provide quick locating of trouble.

Latest in the Air Arm fire control series, the Aero 13 is a refinement of an earlier Westinghouse development that scored the first blind kill of an enemy aircraft over Korea. It is one more example of creative engineering by Westinghouse — airborne defense systems to keep America free.

For estimates in specific fields of airborne electronics defense systems, contact Westinghouse Electric Corporation, Air Arm Division, Pittsburgh International Airport, Pittsburgh 27, Pa.

10040



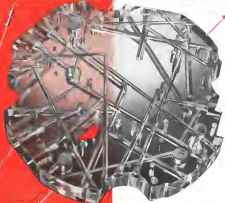
The Aero 13 interposer the complete radar and computing system in a unique handsome package which fits perfectly in the nose of the aircraft. Overhead slotted viewing provides easy pull-out for service.

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WATCH WESTINGHOUSE!
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Making it complex... for simplicity!



This is a transparent model of the magnesium anodized mounting base for the Conquest Service Module hydraulic unit. Note the array of drilled passages which enable for a compact inflatable attitude system package. All external interconnected shutoff lines have been added solid. Components can be readily removed for servicing. The entire system can be tested in a unit and installed in a minimum of time.

The double fluidic system (shown at the left) uses compressed air to deliver electrical power for the attitude, using solenoid through tapered cone valves and cylinders, and hydraulic power for the remotely located oil actuated hydraulic components not mounted on the module and interconnected with nitrogen fuel of "integral plumbing"—a complete portable system with simplicity as the end result.

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Now you a similar design in production? Write Pacific Division, Bendix Corp. available to discuss it with you.

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bottom. The no-inflated antenna and its supporting structure are so light in weight that a magnetar beam (near 400 cps) induces motion as sufficient to rotate the 30 ft antenna at a speed of 6 gms. This is about one quarter the size of the entire model to have a conventional antenna of the size we.

Better Performance

During the past few Westinghouse has been testing pattern tests on the Penobscot antenna step large tower as a global station that permitted the antenna to be elevated and depressed. These tests indicate that its performance is somewhat superior to a conventional antenna, according to James W. Carre, Carre is a manager of the antenna and microwave components section in Westinghouse's Electronic Division.

The superior performance results from the ability to hold antenna constant direction from, accurately with Penobscot type construction then with conventional design. Carre told Syncope West with reasonable cost, the Penobscot antenna structure can be held in position as over the entire surface of a 30 ft dish, Carre says.

Equally important, repeated caution and durability, which often causes conventional antennas to lose their original contour has no measurable effect on the contour of the Penobscot antenna, Carre says.

Because the Penobscot needs no struts for structural support, it does not suffer the antenna wave pattern breakup or shadowing encountered in some conventional ground radar antennas, Carre adds.

The size advantage is applicable to a wide range of radar frequencies, from L-band through K-band. Westinghouse already is planning to apply the Penobscot technique to address the requirements of the new-generation and deployed a model of such an antenna at the recent Utah Association Communications Symposium.

Penobscot manufacturing costs today are about the same as those for a conventional antenna, but should go down with increased manufacturing experience, Carre believes.

Rugged

Because of the relatively small pressure required to inflate the Penobscot, its operation is not affected by moderate leakage or pressure. Penobscot the Penobscot antennas with the equivalent of 30 holes the size of 20 mm shells has caused no adverse effects, according to Stanley Stahler, Penobscot project engineer.

The ability of the small blower to keep the Penobscot from collapsing

due to large leakage was demonstrated when this antenna and two Westinghouse antennas suffered the center of the antenna during a 1000 lb. stress test in the base. Although the door remained open for more than a month, there was no noticeable deformation effect on the antenna.

The inflated air that supports the penobscot is relatively air light. However, the small air compressor used to initially inflate the air is operated automatically to replenish any leakage when the air pressure falls to a preset level.

The Penobscot can inflated under velocities at 125 mph when heated inside an insulated radome (receiving those and with a defense radar), which is ground anchored by means of 30 psi wires, Westinghouse says. The wires are capable of operating over the temperature range of -55 to 1400°.

Construction Details

Each of the two penobscot sections are constructed from pre-pregged pieces ("prepreg") of fabric similar to those used in a woman's pleated skirt. The prepreg is laid out together in a temporary "V" over with pressure forming material in the vertical leg of the "V". The penobscots are ultimately constructed on the radial operation.

When the two penobscots are assembled, they are placed on a large

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circles adjusting focus and adjusted as they take up their natural course.

Beside the Paraboloid, on a special concrete stand (see photo, p. 94), workmen compare the contour of the reflecting paraboloid with a master template. To vary the contour a "T" screw may be let out for (left).

When the desired contour is obtained, the screws are permanently locked by means of tape cemented to the part.

When the coating process is complete, the paraboloid is attached to

the so-called supporting van by means of adjustable tubular struts which make it possible to reposition the light cut of readiness of the assembled unit.

Valuable Men

The assembled radar antenna was removed by Coleman J. Miller, an old army engineer in Westinghouse's Electronics Division. The Paraboloid also revealed as Miller serving two special company orders, totaling \$4,000—the largest order made to a Westinghouse engineer.

This development was carried out as part of a study program for an advanced

light adjustable radar for ARDC. Westinghouse credits ARDC for its willingness to back such an unorthodox idea.

ARDC's Joseph E. Mazzocco actually spoiled the program and John Bennett was project engineer.

Westinghouse subcontracted the fabrication of the first experimental Paraboloid antenna to Cornell University Laboratory which had possessed in the field of aerodynamic design.

Radar Sights

The Paraboloid antenna, and its radome (enclosed into five panels for mobility), are designed to house a complete radar station. The radar equipment is designed to fit under the Paraboloid panels, dividing the area under the radome into two sections, one for radar scope observation and the other for maintenance.

In addition, lightweight mobile heating and air conditioning units also are provided.

Westinghouse says that a trained crew of 20 can set up the complete radar station, including radome and Paraboloid antenna, in two hours.

The radome is first erected and inflated by its own blower system. Once this is done a block and tackle can be attached to the crown piece of the radome and used to erect the Paraboloid antenna.

Westinghouse currently is building four 10-foot Paraboloids, two for the USAF and two for the Marine Corps. It also is investigating the possibility of constructing new paraboloids, driven in inflated manner for special applications.

Experiences to date indicate that the design of a Paraboloid requires about 275,000 man-hours engineering effort—less than required for conventional antennas, Center says. To add to the design, Westinghouse makes small scale models to determine approximate configuration and dimensions of the radar guns.

Based on present fabric materials and mounting tests on an experimental model, Westinghouse believes that the Paraboloid antenna fabric should have a useful life of at least five years.

Mid-Canada Radar Line Will Operate About Jan. 1

Mid-Canada radar warning line along 57th Parallel will go into service about the same time as the DeWitt Early Warning (DEW) line about Jan. 1, 1957. Mid-Canada line will give down direction and rate of attack after DEW line gives first warning.

Further line, based on system, would track and



Rascal the strike from "nowhere"

Bell Aircraft's GAMB-55 Rascal is an air-launched guided missile designed to carry out bombardment of strategic military targets—without the need of launching runs on the target.

Rascal is carried by USAF long range bombers and released miles away from its destination, with the bomber well outside the perimeter of local defenses. Then, while Rascal is speeding one way towards the target, the bomber already is headed for its home base in the opposite direction.

In this manner, Rascal could extend the useful life of the nation's bombardment aircraft and eliminate many hazardous operations for the crews of these bombers, thereby fulfilling two important missions and meeting goals of a strong Air Force.

The rocket-powered Rascal's ability to hit a target while the bomber aircraft is miles away has been demonstrated in a flight test program conducted in conjunction with the Air Research and Development Command.

Bell Aircraft has the weapon system responsibility for Rascal and with the cooperation of its many subcontractors, has developed the electronic, servo and program systems for this air-to-surface missile as well as the radome, launching, ground handling and training equipment.

The Air Force-Industry team urgently needs scientists and engineers for projects vital to the nation's defense. Opportunities to make important contributions are offered in military or civilian careers.



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The micro "go" is completely sealed, cylindrical in shape. Its performance gives a new concept for aircraft switches.

(Send for Data Sheet No. 105)



HERE ARE A FEW EXAMPLES

MULTIPLE CIRCUIT TOGGLE SWITCH MEETS PROBLEMS OF SIZE, WEIGHT, AND CAPACITY

Sturdy reliable, small size micro semiconductor switches are the components of the Type "A" toggle switch. The switch was designed by micro switch engineers for the control of 16 electrical circuits in a .21 inch.

The switches are single pole double-throw and the assembly is operated by a single bar handle. Eight of the switches are operated with each direction of the toggle motion.

This entire 16 switch assembly is but 3 1/2 (2 1/2" in height, including bar handle. It weighs 3.53 oz.

(Send for Catalog File—"Electronic Devices")

THIS HIGH TEMPERATURE SWITCH OPERATES RELIABLY FROM -50°F TO $+1000^{\circ}\text{F}$



Current designers have found this switch an extremely dependable component for their increasing number of high temperature aircraft applications.

Only laboratory tested, heat-treated are used in the manufacture of these switches. The switching element is actuated as a ceramic block and protected with a corrosion-resistant metal enclosure. The switch is available with pin plunger and roller plunger variations. In addition is the post mounting design shown.

This is a compact, lightweight, reliable precision switch capable of operating a wide range of applications where the switch is exposed to extremely high temperatures. For example, as a signal receiver located on a jet engine combustion. Operates reliably at temperature ranges from -50°F to $+1000^{\circ}\text{F}$. (Send for Catalog 62—"Basic Switches")

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Expansions, Changes In Avionics Industry

Bendix Avionics Corp. has purchased a 40% interest in Chertan Devco of Canada Ltd., Ottawa. CDC obtains sales and licensing rights to many Bendix avionics products and will make available its own computer development to Bendix under the purchase agreement. Bendix already owns 70% interest in Avionics Electric Ltd., Montreal, with which it has similar sales/licensing arrangement in its own radio flight control, attitude, radio, search and electrical systems.

Other recent changes, expansions and mergers in the industry include a General Electric Defense Electronics Division has merged its Avionics Unit, Chelmsford and its Special Defense Projects Department into a single new department to be called Avionics and Customer Services Dept. George I. Metcalf, former general manager of Special Defense Projects, heads the new department.

Wheeler Laboratories, Inc., West Neck, N. Y. has started construction on a second laboratory in Springfield, N. Y. The new 11,000 sq. ft. long listed facility will include a 1,000 foot runway ramp and will house 25 engineers and supporting personnel.

Spang Electric Co., North Adams, Mass., has purchased controlling interest in an Italian capacitor manufacturer named CRAS located in Miles New acquisition will enable Spang to enter European and Near East markets previously closed by import restrictions and dollar shortages.

Bendix Radio has opened its new 515 million Advanced Engineering Center in Baltimore, providing 100,000 sq. ft. of air conditioned space for its Avionics R. & D. activities.

Top Industries, Inc., Los Angeles, will acquire assets of Hix-Cold Corp., Danbury, Conn., maker of threaded inserts.

International Business Machines Corp. will build a new research center in Yonkers, N. Y., 38 miles north of New York City. New facilities will house approximately 1,600 scientists, administrative and supporting personnel.

Cook Electric Co. will open a new Technological Center this month in Morton Grove, Ill., a suburb of Chicago. Cook Research Laboratories and related Testing Laboratories will occupy the 175,000 sq. ft. facility which is expected to be staffed by more than 1,000 people.



BLASTING OFF...TO WHAT CEILING?

The severely warped and tilted the system in such question. However, Leland did supply the "answer" to the power problems of the Martin Starliner with the 58-241, 2500 VA Inverter. This is just one example of the proven design and production capability of Leland's Avionics Products Division among the other power problems developed and produced are alternators, inverters, starters, AC and DC generators.

Power supplies are our business. Therefore if you have any new power equipment problems because of higher altitude, higher speeds, special lubrication, special cooling or other unusual environmental conditions, forward all details to our Avionics Products Sales Department. They will completely analyze your specifications and then develop a thorough engineering proposal to meet them. Why not try it today!



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Remember, make a note to stop off and see us at the Aircraft Electrical Displays show in L. A.



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RESOLUTION:
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AC NULL:
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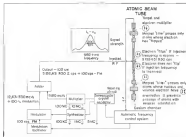
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Over the past 16 years U.S. Time has produced over 535,000 gyroscopes of various types at rates of up to 17,000 per month.



BLOCK DIAGRAM of Atomatch showing principle of operation. Atomic beam tube is offset (right). Unit soon will be available in 60 Mc. airborne model with receiver equivalent to clock that loses three seconds in 100 years.

Precise Atomic Navigation Unit Developed

The "Atomatch," an atom-oscillator type frequency standard accurate to one part in a billion and stable within five feet in 10 hours, will soon be available in a 60-pound airborne model with comparable accuracy. This accuracy is equivalent to a clock that "loses" only three seconds every 100 years.

Developed by The National Co. Valden, Minn. 550 airport and now located in the Navajo long distance navigation system to provide distance-to-target information. Distance is obtained by comparing the phase of the signal received from the ground base station with the phase of the airborne frequency reference. (AW April 16, 1954 p. 52.)

National recently demonstrated two of its larger production model Atomatch units which although operating in independent, autonomous circuit is accurate to within one part in 100 million. All three military services have purchased these units and Rome Air Development Center is using one in connection with its Navajo ground station.

Atomic Reference

Whereas conventional frequency standards must rely solely upon the stability of their quartz crystals the Atomatch uses a crystal oscillator whose frequency is continuously measured and synchronized to the constant frequency of the cesium atom.

The use of this principle to give the period of an oscillator was first

suggested by Professor I. I. Rabi of Columbia University in 1940. Dr. R. Zacharias, one of Rabi's former co-workers and now professor of physics at the Massachusetts Institute of Technology, converted the idea into a working laboratory model.

While the demonstrated basic feasibility, a number of practical design problems remained to be solved—such as eliminating the need for constant pumping to maintain the required vacuum in the atomic beam tube. Zacharias mentioned National in taking over the development and worked with them in a consultant. Present production model will for around \$10,000, but the price should come down with increased sales.

How It Operates

Although presently available Atomatch produces output signals at the frequencies of 0.1, 1, 10 and 100 mc. about any frequency is possible because it is generated from a crystal oscillator. Cesium frequency in turn is converted from an atomic beam tube by a closed loop zero error.

The atomic beam tube causes the atoms to enter a magnetic field which causes them to enter a target because neutral atoms are attracted to the cathode of an electron multiplier which amplifies the cesium input output a million fold.

Any variation of crystal oscillator frequency from the desired value reduces the number of cesium atoms which

A cesium of cesium chloride is placed in one end of a long evacuated tube and heated. This causes cesium atoms to drift away from the post at approximately the velocity of sound. A magnetic field set up near the cesium chamber acts as a filter to eliminate black atoms whose valence electrons and nucleus have opposite alignment. Only cesium atoms with the same valence (arrow leads in same direction).

Crystal Oscillator

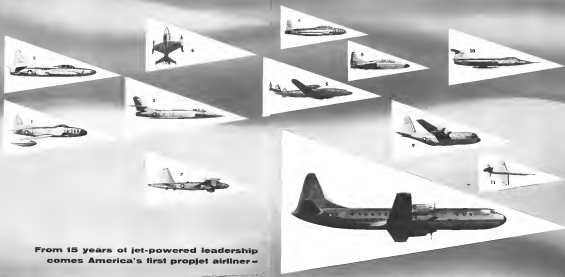
These cesium atoms then enter a chamber where they are excited with radio frequency energy generated by the crystal oscillator. If the frequency of the RF energy is approximately equal to the atomic resonance frequency of cesium (9,192,631,300 cps), the valence electron "flips," or changes its position relative to the nucleus. If the RF energy is not the correct frequency, the electron does not change its energy state.

The cesium atoms continue up the tube to another magnetic field which causes them to enter a target where they have passed, deflecting those that did not.

The cesium atoms that get past the second magnetic filter enter a target because neutral atoms are attracted to the cathode of an electron multiplier which amplifies the cesium input output a million fold.

Any variation of crystal oscillator frequency from the desired value reduces the number of cesium atoms which





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Black agriculturalists heavily invest in structural reforms, despite high production capabilities and experienced economy of operation and maintenance are but a few of the Louisiana Eudora's points of superiority. Its highly African project regime, featuring all-black with private property dependency, enable it to which passenger and one of several for farmers which now handle only 10% of total U.S. air passenger traffic.

The new Lockwood Electric's high speed, wet-shaking alloy end tang 1400 fuel injectors insure greater schedule reliability and

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1. If I'm feeling better, I'll
2. I don't know if I'm feeling better
3. I don't know if I'm feeling better
4. I don't know if I'm feeling better
5. I don't know if I'm feeling better
6. I don't know if I'm feeling better
7. I don't know if I'm feeling better
8. I don't know if I'm feeling better
9. I don't know if I'm feeling better
10. I don't know if I'm feeling better

2. 207 P 04 Shuffling: First of the above information is available for information only. It is not to be used for any other purpose. It is not to be used for any other purpose. It is not to be used for any other purpose.

a. All F-16/F-18 fighters were destroyed on 14 March, which was the only recorded location of military jet pilots in down-breaking zone.

2. PROPOSED NEW JURY BOX: Lower Case
indication is used to indicate procedure
change necessary regarding existing
jury box for all 2 on high speed prop
ships.

4. **Practical tips:** Vertical labels (figure) with 2 set of line (upper and controlling area - smaller side side with light brown/transparent

P. ALLAN/WHO PVV Agency - In
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46 IET F-106: After liftoff — throttle
forward and lighter — a small
Nose Up & Set to 0 — weight —
maneuvering and formation are done

11. **UNIT 17** appears designed as much by Lippincott's design system director. It is one of a family of text units covering anatomy and physiology, written by David Lippincott.

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electrons are stopped by the injected RF energy. This in turn reduces the number of atoms that get past the second magnetic field and are able to strike the target, in turn reducing the output signal from the electron multiplier.

Control Scheme

The electron multiplier signal by itself usually shows that the oscillator has departed from optimum atomic resonance frequency, but fails to indicate in which direction. To provide this vital "sense", the RF signal injected into the atomic beam tube is phase modulated at 100 cps.

The frequency of the atomic crystal oscillator (operating at 5 mc) which generates the microwave output signal as well as the RF injected in the atomic beam tube is controlled by a motor-driven variable capacitor. One phase of this motor is energized from the amplified output of the atomic beam tube electron multiplier, while the other phase is controlled from the 100 cps modulation oscillator.

In comparing the scheme phase of the atomic beam tube signal with that of the modulation oscillator, the sense determines whether the atomic crystal oscillator frequency needs to be increased or decreased and thus the direction in which to drive the variable capacitor.

The required atomic beam tube output frequency is obtained from the 5 mc crystal oscillator by suitable scale phasing and combination with harmonics and subharmonics.

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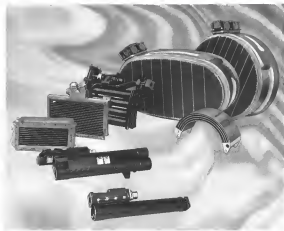
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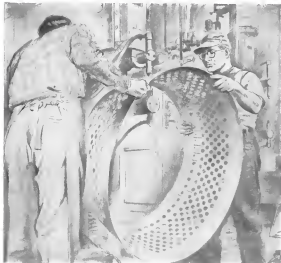
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ings range from 600 v at 100 ma held near to 16,000 v, peak average voltage at 45 ma. Bulletin SR-195A gives specifications data. International Rectifier Corp., El Segundo, Calif.

Laboratory Equipment

• Broadband spectrum analyzer, Model 1791A, permits operation over frequency range of 950 to 16,000 mc with single lead. Detailed specifications are available upon request. Elico Systems and Sales Co., P.O. Machine Works, Inc., Woodside, N.Y.

• Waveform generator, Model 50L, transistorized, battery powered tester, provides stepped waveform and rectangular waveforms output with variable repetition rate of 10 cps to 50 kc. Square wave output is available from 5 cps to 25 kc. By changing one



switch, repetition rates can be reduced to one every five seconds. Rectangular wave slope is continuously variable in pulse width from 5 to more than 200 microseconds. Cohn Corp., San Diego, Calif.

• Transistor circuit power supply, Model T-801-A, operates from 115 v, 60 cps, delivers 0 to 50 v d.c. in three ranges. Ripple is 50 mv maximum and regulation is 1% for line voltage variations between 105 to 125. Sonotek & Co., Inc., 375 Portland Ave., Stamford, Conn.

Microwave Devices

• Precision delay line, magnetostatic type, generates spaced impulses from a single pulse. These are fed into a crystal output which is usually biased to provide desired pulse code. Fifteen pickup coils, positioned by an



electromagnetic means, result in pulses whose position in time is stable to within 1/25 microseconds. Elico Inc., a subsidiary of Elico Systems, Inc., 115 Santa Monica Blvd., Los Angeles 36, Calif.

• Number of models with different type delay materials are available. Elico Inc., 688 Fayette Ave., Massachusetts, N.Y.

• Tape reader type diagnostic cards for telephone at analogizer have a thickness of only 0.008 in., preventing use of very high impedance. Reader can be cut with common into any desired shape for proper matching. Type HIF-1 reader strip comes in standard

dimensions of 183 in. in length, width of 50, 100 and 200 ohms impedance, with other values available on special order. Hirsch Electronics Co., 7117 Santa Monica Blvd., Los Angeles 36, Calif.

• X-band ferrite isolator, resonant absorption type rated for 100 kw is available in four models which cover frequency band of 5.5 to 9.6 kc. Unit provides 16 db minimum reflection of 5 db maximum insertion loss, and has input VSWR of less than 1.10.

Arbort, Inc., Dept. B, 1143 West Elizabeth Ave., Linden, N.J.

NEWS



NOTES

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It may surprise you to know that Edo, recognized as the world's principal manufacturer of airplane floats, is known in many circles usually for its long string of achievements in the field of electronics.

In a broad diversification move which started 10 years ago, Edo has become a preeminent factor in the field of sensor and underwater detection equipment, while continuing and expanding its role of hydrodynamic research which has seen, among other things, Edo's development of the hydrofoil and the first practical amphibious floats.



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SOUNDER



EDO RADAR



EDO LORAN

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Stock Transactions

Field B. Collins, officer and director of Aultco, Inc., has disposed of his total holding of 15,890 capital shares, according to the Securities and Exchange Commission. Officer transaction reported by SEC for the period June 11 to July 10.

NEP Industries Inc. Acquisition of 500 common shares by James B. Clark, officer and director for a total holding of 150.

Whitcomb Marine Inc. Acquisition of 500 common shares by David L. Smith, officer for a total holding of 1,000.

American Airlines Inc. Disposed of 140 common shares for William H. Johnson, Jr., officer, holding a holding of 1,200.

Wright Aircraft Corp. Acquisition of 200 common shares for William H. Johnson, Jr., officer, holding a holding of 1,200.

Continental Airlines. Disposed of 100 common shares for William H. Johnson, Jr., officer, holding a holding of 1,200.

General Electric Co. Disposed of 100 common shares for William H. Johnson, Jr., officer, holding a holding of 1,200.

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- HYDRAULIC CONTROL SYSTEM DESIGN
- EQUIPMENT DESIGN FOR DYNAMIC SYSTEMS TESTING
- POLYMER CHEMISTRY
- HEAT TRANSFER AND AIR-FLOW TESTING

Director having a holding of 44,001.
Sylvania Aircraft Electronics Corp. Division of 1,100 shares by Albert F. Lanning Director having a holding of 71,000.
Lockheed Aircraft Corp. acquisition of 100 common shares by William H. Adams, director for a total holding of 101.

Massachusetts and Nevada Co. Division of 1,000 common shares by C. E. Leland, officer and director having a direct holding of 7,100 and an indirect holding of 9,000, director of 100 common shares by H. M. Brown, director having a direct holding of 44,000 and an indirect holding of 7,100. Director of 100 shares by A. J. Smith, officer and director having a holding of 9,000 and an indirect holding of 7,100.
National Aircraft Inc., acquisition of 100 common shares by Daniel G. Gorman Director for a total holding of 2,000.

Northrup Aircraft Inc. Division of 219 common shares by J. M. Pittinger, director having a holding of 110.

Northrup Aircraft Inc. acquisition of 100 common shares by Steven H. Fry, director for a total holding of 1,000. Acquisition of 100 common shares by Stephen H. Fry, director for a total holding of 1,000 and an indirect holding of 1,000.

Northrup Aircraft Inc. acquisition of 100 common shares by Stephen H. Fry, director for a total holding of 1,000. Acquisition of 100 common shares by Stephen H. Fry, director for a total holding of 1,000. Acquisition of 100 common shares by Stephen H. Fry, director for a total holding of 1,000.

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airship aircraft facilities in Polville and Barham, Calif. A contract for \$995,750 was awarded for research and development facilities in Van Nuys, Calif., at the Missile Systems Division. Of the total amount \$15% is allowed at the rapid rate.

Order certificates awarded for the period Aug. 23 through Sept. 19.

Johnston Corp., San Diego, Calif., military aircraft engine H 111341 awarded with 10% allowed.

Boeing Aircraft Corp., Wichita, Kan., research and development H 111341 awarded with 10% allowed.

Boeing Aircraft Corp., Seattle, Wash., research and development H 111341 awarded with 10% allowed.

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IATA Technical Committee Report:

IATA Urges Better Inspection Methods

(This is the second part of the full text of the IATA Technical Committee report, first published in an article appeared in Aviation Week Oct. 15. Signed by Andrew Veronoff, of IATA's executive committee, the report was delivered at the IATA general meeting in Edinburgh.)

One of the most interesting discussions held during the technical conference in San Ramon was an exchange of views on aircraft structural problems experienced in service and inspection techniques employed.

I will not attempt to summarize the discussion that took place on the highly specialized subject—to do so would be impossible. I would, however, like to put the importance of this subject into its proper perspective and to draw to your attention certain work done about a year ago by a study group of the Technical Committee. The task of this group was to develop the subject point of view with respect to the optimum method of substantiating present levels of aircraft fitness.

One of the findings of the group was that

economic penalties associated with the design of aircraft have been considerable in type before could be recognized, with one depending on the safety of the aircraft, by employing inspection methods such as those which would permit sufficiently clearly that its presence would be noticed on routine inspection before the aircraft as a whole was endangered. The main reason for the development and acceptance of this design philosophy is that it is clearly evident that operators should have more confidence in the development of new and more efficient inspection methods and techniques.

To date, we have depended largely on visual inspection involving less weight inspection devices, various methods, etc., to detect the various defects that occasionally occur in aircraft structures. As it well known, it is impossible to inspect all parts of the aircraft structure so we were this method. It is often necessary to do available major portions of the aircraft part to make sure that nothing is going wrong. Usually the inspection is based to be perfectly sound and in a sense of the

work of taking the aircraft apart and putting it back together has been a task. Not only is the workload of maintenance men heavy, but it even guarantees inspection, the fact that the aircraft is kept out of service for considerable periods of time—often a factor which is becoming increasingly important with aircraft extremely high speed aircraft.

From the above considerations it becomes immediately apparent how expensive it is that airlines and manufacturers to undertake every possible means to that disposal to maintain the dependability and reliability of inspection methods and techniques, and that a complete change of maintenance and inspection methods is in order. It is not unusual that no better opportunity than the type of working could possibly exist for such an exchange.

An stated previously, it is impossible to examine an exchange of items. I would, however, like to comment on the method of the working towards the various inspection methods in inspection work need be advised in detecting defects in aircraft structures, e.g. visual inspection, use of dye

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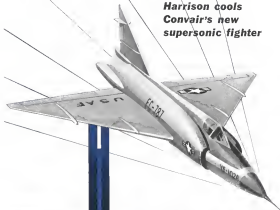
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ponents, Xmas, aluminum substitutes, rugged, impurities, etc. It was unanimously agreed that of these methods no one could be considered as being either 100% reliable or the best method to be used in all cases. It was agreed, too, that there was a considerable degree of overlap in the use to which many of these tools could be put. In general, therefore, it was agreed that they should be considered as complementary means of covering a very broad field and that complete faith should not be placed in any one method.

In conclusion I would like to echo the hope expressed by the meeting that the exchange of views which took place on this subject in San Diego would mark the first of many similar discussions to follow, and that through such exchange of experience our respective departments would be able to perform their task with increasing dependability and efficiency and thus help greatly the trust placed in them by the entire industry.

COMMUNICATIONS MATTERS

Communications is a service, which at first every phase of airline operation and, for that reason, a good deal of what I have to report to you on both communications and radio equipment and its more appropriately covered by other departments—actually, under Air Traffic Control and Regional Affairs. For example, in last year's technical report Mr. Dugan emphasized the growing importance of radio-telephone in airborne communications and this year, the related radio-teletype program that I have to report will be covered in no separate section. However, I have selected three communications matters which I believe will be of interest to you and the first of these is all an operational discussion.

The members of our Technical Committee have the same time been becoming more and more appreciative of the fact that, as far as the field of communications and radio aids are concerned, it is necessary to look quite far in the future and plan to anticipate many difficulties before they have actually made their presence felt in day-to-day operations.

On an individual basis, such future planning work and the placing of all leaves a problem in first true relative positions of importance to those great communications interests, and we felt in need of similar guidance and assistance at the national level. Consequently, we have constituted a small Communications Advisory Committee—now generally known as COMVAC. The group consists of eight experienced air line communications executives who are advising us on such program matters and the desirability of participation in such non-ATA communications activities as are of importance to civil aviation. In other words they are watching the best interests of all our member airlines in order to make certain we are concerned and developing the operational programs which constitute realistic products in the Technical Committee.

Late in 1955 we held a worldwide communications meeting to develop a set of

pattern characteristics for an airborne Single Sideband High Frequency communications system. This technique for communications—now generally known as SSB—has for some years been used successfully in certain ground point-to-point communications. Its inherent advantages are that a given SSB communications channel occupies only half as much spectrum space, while maintaining good signal strength and appreciable expansion—especially in the face of certain types of propagation disturbances. Data from some of the many technical problems that had to be solved in the laboratory before SSB techniques could be applied to airborne equipment, it has been necessary to evolve a plan that will permit a progressive transfer from our present

techniques of HF communications to the SSB mode, and this now appears to be entirely practicable if the approach developed at the IATA SSB compatibility meeting, is adopted satisfactorily by states. To this end, we have constructed our proposals to COMVAC and the whole subject will be considered by the ICAO 6th Communications Division, which is due to meet in the latter half of 1957.

The final communications matter in which I would like to report has already been touched on earlier in connection with Air Traffic Control—and that is the need for increased amplification to communications procedures.

A great study of this subject was made during the 5th Technical Conference and

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SAFETY

I am pleased to say that although considerable time has elapsed since past conferences, again, on this occasion all participants are fully aware of the need to reduce to every practical extent the loading of aircraft and to make it a paramount objective of the industry to develop methods to simplify manual maintenance, especially with regard to those categories of aircraft that serve most frequently on the ground element. Particular emphasis was placed upon the simplification of aircraft position reports and the elimination of the high degree of redundant meteorological information which is often sent to aircraft in flight.

AIRBORNE WEATHER RADAR

Last year, my predecessor reported to you that the question of airborne radar was a subject of growing interest among AVCA members. More than a number have already installed such equipment and are rapidly gaining experience with it in every day operations. Many others are known to be planning programs of installation of this and all of which presented at our last technical conference in fact, a broad exchange of views between aircraft and equipment manufacturers. In a report of the length I could not possibly summarize what we learned and what equipment manufacturers disclosed was not such. However, there are a few points coming out of the discussion which stand out above others and I feel you should hear about them in your own words.

The tangible advantages that have resulted to those companies which already use this data warning radar are several. First, as has been pointed out, there is a considerable reduction in the number of accidents due to weather. Second, there is a reduction in the number of accidents due to weather. Third, there is a reduction in the number of accidents due to weather.

In intangible terms the equipment has the advantage of permitting continuous detection of potential weather hazards. Light waves in the carrier frequency of spot 1 and advantage value. It has also reduced cockpit workload significantly under stress conditions, owing to fewer divergences from the intended track, resulting in fewer requests for clearance for other than in flight plans, thereby lessening the volume of air-ground communications.

The equipment can be put to a number of other uses secondary to its main function of storm detection and avoidance. These include navigation and routing and, in some cases, detection of ships at sea, etc.

It is not surprising, therefore, that there is much active interest in the equipment and that substantial orders have been placed with manufacturers.

METEOROLOGICAL SERVICES

Last year my predecessor reported to you fully on the developments in the field of meteorology which are of clear interest to the entire aviation report, i.e., on the completion of the ICAO Meteorological Annex to the Chicago Convention, and of the ICAO Meteorological Procedures for Air Navigation Services. You were also



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What happens to metals at 25,000 m.p.h. 200 miles up?

General Mills scientists are finding some of the answers to this question, which bears directly on space ships and man-made satellites.

Their findings indicate that materials to be sent into space must possess properties not found in today's area and alloys. Since few new metals remain to be discovered, they conclude that present ones must be given new properties to cope with the heat barrier and to keep vehicles from disintegrating under particle bombardment.

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- **Rubber meteorological information.** such as hourly observations and airport forecasts for certain hours, would be given to a pilot by the air traffic service, wherever he is required. In areas with high traffic density, this information should be put out on a regular basis by scheduled broadcasts so that the pilots could interpret the particular information they required and then avoid overloading of available meteorological channels by multiple individual requests.

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- **Rubber and non-rubber information** would also be given to a pilot in flight by other ground communication stations where he required such information from them, or when his service desired to direct to him meteorological data of advance his to discuss about the conduct of the flight.

METEOROLOGY

Since then the efforts of your meteorological and operations specialists have been devoted to the application of these principles and to the problems associated with the supply of meteorological information to aircraft in flight under meteorological. Though there are still some minor differences between the methods recognized by ICAO and those sought by IATA, a great deal of progress towards an objective has been achieved in the CAN, ICAO and IATA Regions.

Last EUNEARL Technical Panel prepared a detailed outline of requirements, listing, for each regular report, meteorological information in respect of other regular and forecast reports as the region, which should be made available as a rubber basis so that the air traffic service or the communication station was aware of the meteorological information. IATA has proposed a plan of VHF VOLMET (Voluntary Meteorological) for Europe, and it is probable to note that the value of this work has been recognized by many states, which have implemented it as a matter of fact. IATA proposals, even though they are not yet embodied into the ICAO regional plan.

Since a large number of air services have already been established in the primary stages of communication, they have been, much easier to be done in establishing effective regional plans for the use of air traffic service in meteorological, in the information made in this respect IATA is now devoting its attention to the Southern Area Region, where no

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HELIOTOPERS

planning a wide operation by an RC-119 Air Traffic Control (ATC) to be used in only a few cases.

HELIOTOPERS

A year ago, the work being done by one Helicopter Group was reported to you. At that time the group had just completed the first phase in its development of helicopter policy with respect to various present problems.

It is now my pleasure to advise you that another step forward has been taken in connection with the work through the convening of an industry-wide meeting at San Diego just prior to the 9th Technical Conference. The primary purpose of the meeting was to obtain the views of other branches of the industry with respect to the various portions which we had previously contributed before group their full policy input.

A comprehensive report of the meeting has been prepared, but I would like to mention a few of the highlights here which I think will be of particular interest to you. To start with the question was then in stating that representatives for two types of multi-engine transport helicopters were a 75 percent maximum capacity of about 40-50 passengers. The smaller aircraft should have a cruising speed of 300-350 mph for multi-engine type operations for and tactical rates and 150 mph for emergency rates. The range of such an aircraft should be at least 100 mi. with normal fuel reserves. The descent operating rate should not exceed 75 mph per mile, but not more. The 40-50 passenger aircraft which could be used for emergency operations should have a cruising speed of 150 mph with a range of 100 mi. (including normal fuel reserve) and a descent operating rate per available mile of not more than 4-5 mph.

In discussing these requirements for future transport helicopters the operators showed the fact that the performance and handling characteristics of these aircraft must be such as to permit safe emergency operations into and out of 300 x 400 ft. island and landing areas located in city centers. It was suggested that if more helicopters were now in service than this space available but it was the opinion that the helicopter would soon reduce its full potential and it could meet the 300 x 400 ft. requirement as stated.

The manufacturers must continue to cut down their delays to produce helicopters that could meet all the operators' requirements. Through the numerous members of the type specified local they and be available in three to five years. Large aircraft of the 40-50 passenger category type as current development and could be made available about five years after a decision was taken to go ahead with production.

Another point considered by the meeting was the requirement for adequate helicopter facilities periodically in large metropolitan areas. Specific guidance to city planners was given with respect to obtaining clearance facilities required in addition to the 300 x 400 ft. island and landing area mentioned above. It was held to be most important that responsible city ad-

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SAFETY

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Relays that transmit messages are significant reduction in the large quantities of time of message around each transition to arrival. We want flexibility, rely on other necessary to expedite traffic, improving existing facilities, streamlining procedures and equipping all known communications techniques. This was the prime motive of the recent special meeting of North Atlantic states which was concerned largely at the suggestion of IATA.

IATA regional activity in Europe, Africa and the Middle East continues to move a large share of attention. The FINEART (Technical Panel) and the various local panels associated with it have intensively applied themselves throughout the year to the task of determining acts and events which could and eliminating them acceptance through negotiations with ICAO and with other civil aviation authorities. The panel has determined completely action requirements in VOR stations throughout Europe, Africa and the Middle East, while at the same time working on liaison projects towards the representatives of its member for securing better facilities and more direct contacts between terminals.

Looking also the future, ICAO will now serve a fourth European Regional Air Navigation meeting in June 1957. This meeting from the subject part of very well calculated to the most important ICAO RAN meeting held to date, since it will have to take into account not only the complexity of the regional radio services, but also the importance of air transport which is every more an important in the region. It can not escape the all the future activity of the FINEART Technical Panel will be devoted to the planning for the very important meeting.

Last year our good friend Mr. Dupont referred to the formation of an agency under the North Atlantic Treaty Organization in which the coordination of civil and military air movements must be developed. It is planned to assist that the agencies now known as the Committee for European Airpower Coordination is giving a valuable input for the discussion of civil and military claims to the crowded airspace and Europe. Although some problems remain, we finally believe that they will now be solved through continued consultation and co-operation and to the end, we welcome the opportunity to enter the wider cooperation in this connection.

Airline Problems

An extension of our activities is being given in Southeast Asia where a series of ICAO technical meetings is currently holding a number of air traffic and communication problems. IATA participation in these meetings is linked by facilitating activity and sound preparation and it is hoped that considerable benefits to the operations in Southeast Asia will result. Plans are also in hand to step up the tempo of IATA's activity in South America.



to weight engineers

who seek preliminary design assignments

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SAFETY

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Our current work program, as which the Vice Technical Committee in New York had a unanimous effort, clearly sets for a study of a number of problems related to the operation of jet transport aircraft. Many scientific, political and economic and how to be developed by a number of our study groups. Close contact will have to be maintained with the administration and research organizations of a number of nations.

A lot of attention will have to be devoted to repeated planning to ensure that on the day when the jet arrives, there will be support and ground facilities necessary to receive them and provide their safe operation.

I can therefore predict that the next year or the few years to come will be very busy for us. IATA's technical aircraft and risk demand a great deal of effort on the part of your technical and operational personnel. In this respect I appeal to you let us have your best ideas for problems before us in many and their solution of great importance. Since a great deal is at stake.

CONCLUSION

In closing, I wish to pay my high tribute to the members of the Technical Committee who have guided the Association's technical activity during the past year, and to all the other fellow technical experts who, through their interest, advice, efforts, and sound knowledge of the various fields of aeronautics, have contributed much to our technical achievements during the past year.

I am honored to report to you that the Technical Committee elected me to serve as its chairman for the forthcoming year, and am proud that I will do my utmost to discharge my duties to the best of my abilities.

I wish also to welcome you that I shall have the able assistance of Capt. J. W. G. Jones, Flight operations director of British European Airways, as my vice chairman, and of Mr. S. B. Kaufman, assistant vice president and chief engineer of Pan American Airways, to assist me in this task.

My report on last year's technical activities of IATA would not be complete without a list of people of appreciation for your persistent technical involvement. The technical director, Mr. Stan Koryntowski, has known to all of us the his staff experience, tact and cheerfulness with his extremely small group of members in Montreal and London last guided all our technical problems with careful planning and thought and has done much to simplify our work and save our time even during the days of most involved problems. I commend and thank them for their efforts and efficiency.

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PERSONALING is designed to save the employer time, money and money when the odds are in his favor. The employer can save the man the money.

If today PERSONALING—PERSONALING is the only way you can get the best of the best. PERSONALING is the only way you can get the best of the best. PERSONALING is the only way you can get the best of the best.

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Take command of your future

FLY AS A CO-PILOT WITH TWA

Your future is yours to command when you fly on a TWA co-pilot. You'll be flying the world's finest equipment with the world's finest pilots.

JUST LOOK AT THESE ADVANTAGES

—starting salary of \$8000 a year, first day of training, beginning with the third year, to pilot reserve monthly base pay and guarantee of 60 hours of flight pay, annual sick leave, paid vacation, liberal free transportation for you and your family each year, insurance plan, group discounts and many more.

QUALIFICATIONS: April 22 to 26, between 21" and 23", one year TWA ground time, four 400 hours total pilot time, CAA Commercial Certificate and sufficient experience test to qualify for Instrument Rating. Please telephone Person Dept. 424.

There's a wonderful place waiting for you with TWA. Use your letter of today to Mr. R. Paul Day, Personnel Manager.



TRANS WORLD AIRLINES
NORTHERN AIRPORT
KANSAS CITY, MO.

Engineer, Design

NUCLEAR AIRCRAFT ENGINE MECHANICAL CORRESPONDENT AND EXAMINER

Form 11 (only name do) is the only way to get the best of the best. PERSONALING is the only way you can get the best of the best. PERSONALING is the only way you can get the best of the best.

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WIND AND

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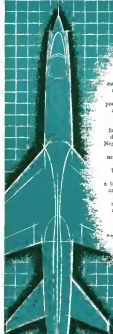
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DESIGN ENGINEERS



You need no second introduction to the "parameters" of a design problem. They establish the boundaries you must work within—in every detail from wings to surface finish.

Neglect them? Not when they influence your solution from beginning to end. But what about the parameters that influence your career?

They are boundaries, too, governing your professional progress. And when they take the form of a mediocre job, or a closed door to a desired promotion, they can choke your growth. Neglect these career parameters? Not when you can exchange confining conditions for wide, new boundaries at Chance Vought. Here is a design organization with spectacular products like the Thorpess Trophy-winning Crusader fighter to its credit, and others in store. Here is a live, expanding design environment where you can advance to the limit of your abilities.

Why not apply for these opportunities, or arrange for a first-hand appraisal? Just send a summary of your experience and education to:

Engineering Personnel Dept. 10-3

CHANCE VUGHT AIRCRAFT
INCORPORATED, Dallas, Texas



- Lower height ... (.205" vs. .254")
- Narrower width ... (.328" vs. .400")
- Lighter weight ... (.25 #/C vs. .35 #/C)
- Counterbored ... (.060")



New Low-Height Counterbored Locknuts Conform with NAS Drawings

The new ESNA LHTA51 series of self-locking nuts was designed to meet the requirements of the recently released NAS679-695 drawings for low-height counterbored nuts. Intended for structural use, and developing the full tensile strength required by Spec MIL-N-25027 (ASG), they perform satisfactorily at temperatures up to 550°F. These parts have also been approved to AN-N-10 and drawings AN362 and AN366.

The LHTA51 series offers several special advantages to the designer:

Minimum envelope dimensions and weight compatible with performance to the tensile, vibration, twist-out and push-out requirements of MIL-N-25027 (ASG).

Reduced height permitting use of 160,000 psi heat treat short length NAS bolts to still further cut down weight of nut and bolt assembly.

Counterbore in the base of the nut assures that bolt threads will not be in bearing. This eliminates the weight of an extra shim in many applications.

Repeated use and reuse without loss of efficiency.

CHOOSE THE SOLUTION TO YOUR FASTENING PROBLEM FROM A COMPLETE LINE OF NUT SHAPES!



One lug Floater
(#8 through 5/16")



Two lug "Fixed" anchor
(#8 through 5/16")



Two lug "Floater"
(#8 through 5/16")



Gang Channel
(#8 through 5/16")

(and others not illustrated here)

**ELASTIC STOP NUT
CORPORATION
OF AMERICA**



MAIL COUPON FOR DESIGN INFORMATION

Dept. N18-1025, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, New Jersey

Please send me the following free fastening information:

- ☐ Spec Sheets on New LHTA51 Series ☐ Here is a drawing of our product. What type of self-locking fastener would you suggest?

Name _____ Title _____

Company _____

Street _____

City _____ Zone _____ State _____